

Innovative Association of Academia and Governance for Disaster Risk Reduction



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APRU

13th APRU Research Symposium on Multi-Hazards around the Pacific Rim

Innovative Association of Academia and Governance for Disaster Risk Reduction

Proceedings of the 13th APRU Multi-Hazards Symposium 2017

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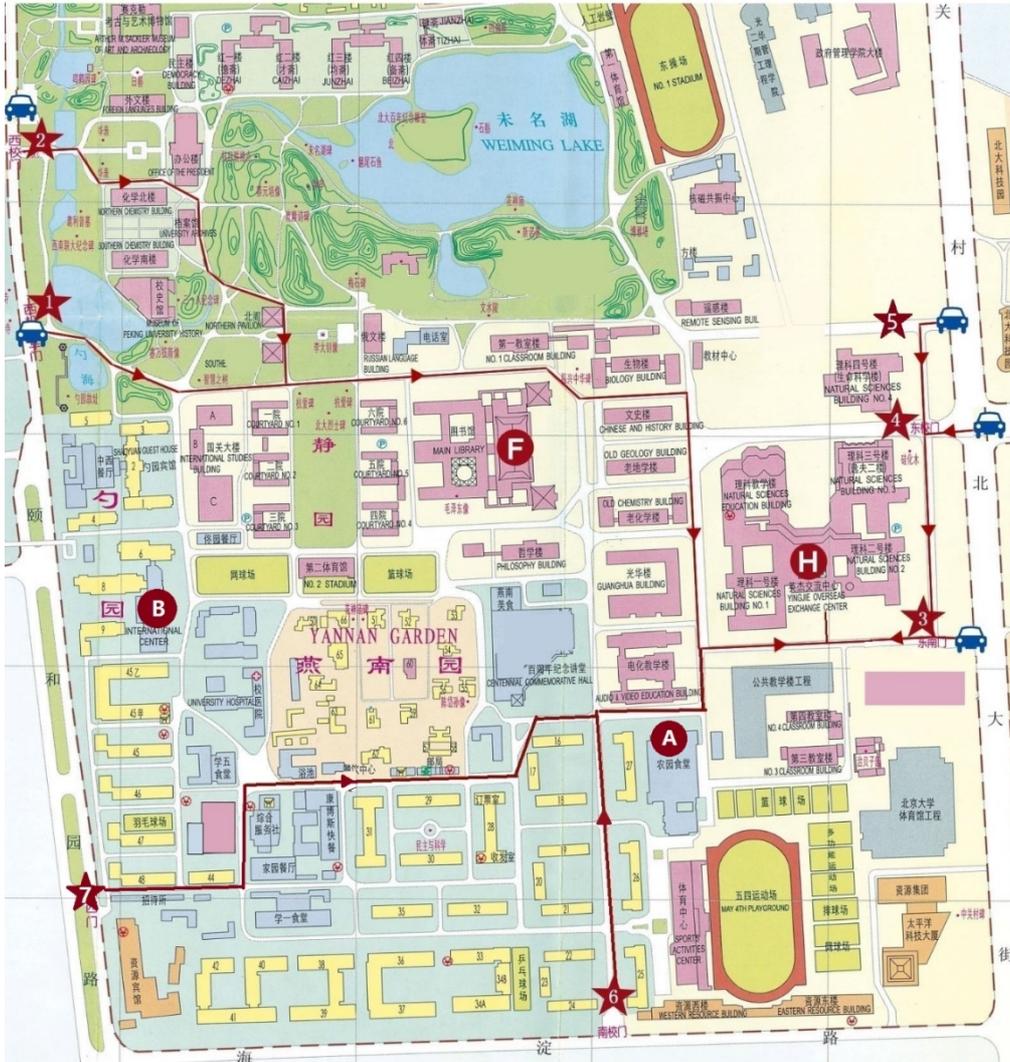
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PKU Campus Map

北京大学燕园校区地图 Map of Peking University Main Campus



1. West Side Gate

2. West Gate

3. Southeast Gate

4. East Gate

5. Northeast Gate

6. South Gate

7. Northwest Gate

A. Nongyuan Dining

B. Shaoyuan Dining

H. Overseas Exchange Center

F. Library

Center Center

Committees

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International Steering Committee Executive Chair

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Xiangshuang

Meng

Peking University

Wanyuan Cai

Peking University

Xu Yan

Peking University

Programs

Day 1: Aug. 28, 2017

- **8:00-9:00 Registration**

The 1st floor hall of Overseas Exchange Center

- **9:00-9:30 Opening Session (Chair: Prof. Lei Yan, Venue: Moonlight Hall)**

- 1) Welcome address: Prof. Jingyun Fang, Vice dean, Faculty of Science, Peking University
- 2) Welcome address: Ms. Christina Schönleber, APRU Director (Policy and Programs)
- 3) APRU' s Multi-Hazards Program Overview: Prof. Takao Izumi, Tohoku University

- **9:30-10:00 Photo Session & Coffee Break**

- **10:00-12:00 Keynote Presentations (Chair: Prof. Yu Liu, Venue: Moonlight Hall)**

Time	Title	Speaker
10:00-10:40	Remote Sensing, An Effective Technique for Disasters Management.	Prof. Qingxi Tong
10:40-11:20	A few ideas for academia to implement the Sendai Framework for Disaster Risk Reduction	Prof. Yuichi Ono
11:20-12:00	Successes and Challenges of Institutions of Higher Education in Latin America towards Advancing the Disaster Risk Reduction Agenda ;	Prof. Sidney Velado

- **9:00-12:00 Poster Session, Moonlight Hall**

- **12:00-13:30 Lunch (Nongyuan Dining Hall)**

- **Session 1: Theory and Methods (Chair: Baoyu Jiang, Peijun Li, Meeting Room #3)**

Time	Title	Speaker
13:30-13:50	An Urban Nexus-based Approach to Critical Infrastructure Protection	Tailin Huang
13:50-14:10	Development of New Approach in Determining the Optimum Number of Relief Operation Centers	Ma. Teodora Gutierrez
14:10-14:30	Assessment of Banks Resiliency in Natural Disaster through Business Continuity Management Plan	Alexander Gutierrez
14:30-14:50	From Structural Mitigation to Comprehensive Risk Governance: The Change Course and Future Direction of Disaster Prevention and Control Mode	Yaoyuan Li
14:50-15:10	How Public-Private Participate in Disaster Reduction	Wu-Chueh Hung

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	and Prevention	
15:10-15:30	How early vascular plants survive frequent fluvial floods: evidence from a 410-million-year plant and its roles in landscape stabilization.	Jin Zhuang Xue
15:30-15:50	Effects of Mesozoic volcanic eruptions on exceptional preservation of fossils in lakes.	Baoyu Jiang
15:50-16:00	Coffee Break	
16:00-16:20	Spatial pattern of rocky desertification in southwest China and its driving forces	Miao Jiang
16:20-16:40	Coping Strategies to Natural Disasters	Jun Carlo Sunglao
16:40-17:00	Prospective Application of Unmanned Aerial Vehicle Technology to Emergency Rescue in Disaster	Rongmei Geng
17:00-17:20	Seismic Geodynamics of Longmenshan Faults	Fang Peng
17:20-17:40	Stress development in heterogeneous lithosphere: Insights into earthquake processes in the Tan-Lu Fault Zone.	Jie Li
17:40-18:00	Stress development and Earthquake Migration: Insights into Earthquake Processes in the Bo-Zhang Fault Zone	Bo Shao

● **Session 2: Policy Studies (Chair: Indrajit Pal, Yi Lin, Meeting Room #4)**

Time	Title	Speaker
13:30-13:50	Disaster Governance in Bhutan Amidst Democratization and Urbanization	Caroline Brassard
13:50-14:10	Discussion on Exhibition Representation in Chinese Disaster Museum	Xin Gao
14:10-14:30	The Influence of Disaster Risk Reduction Agencies' Collaboration on Elementary Schools in Sichuan, China	Yixuan Chen
14:30-14:50	Policies and Institutional Framework for Disaster Risk Governance – a case of 2015 Myanmar Floods	Indrajit Pal
14:50-15:10	Governmental Steering in the Market Dynamics to Ensure Environmental Risk Management : focused on the Mandatory Environmental Liability Insurance System in Korea	Boram Hong
15:10-15:30	Cascade Retinex: A new multi-scale image processing algorithm	Ying Su
15:30-15:50	Public awareness and public education for disaster risk reduction Adviser	Muhammad Naeem Khan
15:50-16:00	Coffee Break	
16:00-16:20	Private enterprises in the Government's disaster prevention education promotion - case study of medical institutions	Ying-Cheng Chen
16:20-16:40	Multi-hazard prone state of Uttarakhand, India on road to disaster risk reduction	Piyooosh Rautela

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16:40-17:00	Physical Impact Assessment of Flash-Flood Hazard in Small Island Developing State: Case Study on St. John's and Gouyave Watershed, Grenada	Rahmat Aris Pratomo
17:00-17:20	The Missions of Armed Police during the 2022 Olympic Winter Games and their emergency measures	Linke Wen
17:20-17:40	Types of natural disasters and monitoring systems in the World Heritage Site of Hoh Xil, Tibet Plateau	Tongwen Wu
17:40-18:00	The "Community" in Community-based Reconstruction Projects: Lesson Learnt from Nepal Earthquake 2015	Lai Ming Lam

- **18:30-20:00 Dinner (Shaoyuan Dining Hall)**

Day 2: Aug. 29, 2017

● **Session 3: Application Techniques (Chair: Jun Wang, Mei Li, Meeting Room #3)**

Time	Title	Speaker
8:20-8:40	Landslides Forecasting Based on the Hydrological Process Simulation by the Program PCSiWaPro® in an Earth Dam	Jinxing Guo
8:40-9:00	Community-based Adaptation to Flood Hazards in the Active Floodplain Char-lands in Bangladesh	Mohammad Najmul Islam
9:00-9:20	Research on urban flood warning system design and its application	Wang Zhe
9:20-9:40	Dynamic Display of Population Thermodynamic Chart based on Mobile Terminals for Earthquake Emergency	Xiaoli Liu
9:40-10:00	Modeling the Traffic Disruption Caused by Pluvial Flash Flood on Intra-urban Road Network	Mengya Li
10:00-10:20	A Prediction Scheme of Tropical Cyclone Frequency Based on Lasso and Random Forest	Tan Jinkai
10:20-10:30	Coffee Break	
10:30-10:50	Flood warning system of Tamsui River using ensemble rainfall forecasting	Ming-Ren Chen
10:50-11:10	Researches on Emergency UAV Intelligence Reconnaissance and Communication Relay Command System	Ming Zhaohui
11:10-11:30	The Correction Model of MODIS PWV of Hebei Province, China based on GNSS	Yong Wang
11:30-11:50	Effects of sea level rise, land subsidence, bathymetric change and typhoon tracks on storm flooding in the coastal areas of Shanghai	Wang Jun

● **Session 4: Application Techniques (Chair: Guiting Hou, Qiming Zeng, Meeting Room #4)**

Time	Title	Speaker
8:20-8:40	The power of Art as vital role for creative recovery from disaster: Cases from Christchurch, New Zealand and Melbourne, Australia	Junko Otani
8:40-9:00	Measuring Disaster Recovery Progress from Community Cognition: A study on Cyclone Aila Recovery in Koyra, Bangladesh	Md Shibly Sadik
9:00-9:20	China' s Pairing Support Method (PSM) as a post-disaster recovery strategy	Jing Li
9:20-9:40	Disaster vulnerabilities and cultural resiliencies: Developing and transmitting the Suguidanon (Epics of	Clyde Ben Gacayan

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	Panay, Central Philippines) amidst Climate Change	
9:40-10:00	Study on the Influences of Emergency Rescue in Multi-hazard Scenario—— A Case Study of Earthquake and Snowstorm in Xinjiang	Yuting Wang
10:00-10:20	Comparison of the disasters of the prehistoric Lajia site and the modern Beichuan City.	Qinglong Wu
10:20-10:30	Coffee Break	
10:30-10:50	Ancient seismite in Beijing, North China.	Dechen Su
10:50-11:10	Lessons learnt from the 2009 Padang, 2011 Tohoku and 2016 Muisne earthquakes	Siau Chen Chian
11:10-11:30	Comparison of two flood areas, char and inland, in Bangladesh : Implication for Japanese hazard mapping technology	Kumiko Fujita
11:30-11:50	Enhancing Community Resilience to Climate Change-Related Disasters through Risk Communication: The Case of Amulung, Cagayan	Ellaisa Ruth Veluz
11:50-12:10	Sister Village : A Disaster Risk Reduction Concept based on Local Indigenous in Magelang District	Fachrul Rizky

● **12:00-13:30 Lunch (Nongyuan Dining Hall)**

● **Session 5: Application Techniques (Chair: Clyde Ben, Meeting Room #3)**

Time	Title	Speaker
13:30-13:50	Research on emergency oriented mobile positioning data storage	Min Liu
13:50-14:10	Subsurface water flow monitoring through integrated probability tomography of self-potential data	Kaiyan Hu
14:10-14:30	Spatial and Temporal Distribution of Main Flight Exceedance Events Based on FOQA Data	Yue Chen
14:30-14:50	Enhanced Surface albedo since 1987 and influence on local climate in southwest Kunming and Dali City, Yunnan	Xueyun Lu
14:50-15:10	Building damage detection from bi-temporal VHR image using object-based histogram of spatial homogeneity index	Junru Liu
15:10-15:30	Comparisons among methods of non-buildings identification based on post-earthquake polarimetric SAR images	Yuliang Nie
15:30-15:50	Multivariable Dynamic Prediction of Gas Concentration Based on Deep BLSTM Model	Ning Zhi
15:50-16:00	Coffee Break	

● **Session 6: Case Studies (Chair: Asset Akhmadiya, Meeting Room #4)**

Time	Title	Speaker
13:30-13:50	Along strike variations in the electrical structure of the Gaoligong shear zone in west Yunnan, SW China: insights from 3D magnetotelluric imaging	Tao Ye
13:50-14:10	Disaster Assessment of Development in Rural Travel of Bedrock Channel in ChangZhou Village, Jixian, Tianjing	Shih-Yang Lin
14:10-14:30	Scenario-based hazard analysis of extreme high temperatures experienced between 1959 and 2014 in Hulunbuir, China	Chunlan Li
14:30-14:50	A new method using multi-temporal Sentinel-1 data for building damage assessment on example 2016 Italy earthquake	Asset Akhmadiya
14:50-15:10	A new seismic disaster risk assessment model considering earthquake business insurance	Aiping Tang
15:10-15:30	InSAR Processing of Sentinel-1 TOPS Data and Its Application in Disaster Monitoring and Identification – A Case Study of 6.24 Maoxian Landslide	Meng Zhu
15:30-15:50	Extracting deformation of the fifth North Korean nuclear test with D-InSAR	Zimin Zhou
15:00-16:00	Coffee Break	

● **16:00-17:00 Closing Session, Chair: Dr. Yi Lin, Meeting Room #3**

1. Awarding Ceremony
2. Closing Address, Dr. Yu Liu
3. Closing Address, Ms. Christina Schönleber

Abstracts

1 **TITLE: An Integrated Framework of Theories and Models for Multi-Disaster Risk, Perception, Behavior, and Policy Analysis**

Author: Guoqiang Shen*

***Address:** The University of Oklahoma, USA

KEY WORDS: Risk, Perception, Behavior, and Policy Analysis, Framework, Multi-Disaster, Theory and Model

ABSTRACT: There are many different types of disasters, including natural such as tornado, hurricane, earthquake, fire, and drought; technological such as chemical spill or bridge collapse; and terrorist attacks such as bombing. Each year, those hazards happen and cause catastrophic damages to the human lives and the economy. Research on disasters has a long history from engineering, social science, and public policy perspectives. Considerable theories, models, and techniques have been developed over the years on disasters and their related risk, perception, behavior, and policy. Yet, there is not an integrated framework that connects these elements into a comprehensive modeling process, which is important for the general public and decision makers, regardless from the government, the academia, or the industry, to have the best understandings, actions, or policies about disasters prevention and mitigation.

2 **TITLE: A Multi-Hazard Risk Analysis of Global Natural and Technological Disasters**

Author: Guoqiang Shen*

***Address:** The University of Oklahoma, USA

KEY WORDS: Natural and technological; disaster; country-level risk; fatality, injury, affected, and damage; portfolio and regression.

ABSTRACT: This research first develops a portfolio-based risk model and applies it to global natural and technological disasters recorded for the 1900-2015 period in the EM-DAT database developed by the Centre for Research on the Epidemiology of Disaster (CRED). Disaster risks, measured as country-level expected values of historical fatality, injury, people affected, and damage are computed for nearly 200 nations. Relevant measures of each county's expected risk, such as its standard deviation, coefficient of variance, range, and rank are also calculated and used together with the expected risk to assess a country's overall risk. Social-economic-physical factors from the World Development Index developed by the United Nations (UN) and relevant to natural and tech disaster occurrences and risks are then identified using multivariate regression with high *R*-square values at 95% to 99% confidence intervals.

The results show that high natural and tech risks concentrate in a small number of countries, which are typically large in population, fast in development, or well advanced in industrialization and technology, with the top ones such as China, India, Bangladesh in Asia, U.S., Mexico, Canada in North America, Turkey, Russia, France, Germany in Europe, and Algeria, Egypt, and Ethiopia in Africa. Also, important social, economic, , and physical

factors, such as population, territory, GDP, income, transportation, and CO2 emission, are strong in explaining and predicting county-level natural and tech risks.

3 TITLE: Examining the role of urban form in supporting rapid and safe tsunami evacuations: a multi-scalar analysis in Viña del Mar, Chile

Author: Jorge León*; Cyril Mokrani; Carolina Femenías

*Address: CIGIDEN, Chile

KEY WORDS: Tsunami, Evacuation, Urban form, Multi-scalar analysis

ABSTRACT: Large populated coastal areas in the Pacific Rim are exposed to destructive near-field tsunamis. Globally, long-term changes in the urban built environment have been proposed to mitigate this type of risk (e.g. large civil-engineered defenses, land-use regulations, and building codes). Moreover, the role of the built environment's physical urban form in supporting populations' rapid responses to tsunamis (such as evacuation and sheltering) has been increasingly recognized and examined through agent-based models, network analyses and 'what-if' scenarios. Nevertheless, much of these efforts remain focused on the large-scale of the urban configuration, i.e. the system of linked spatial elements (streets, squares, parks, etc.) through which people move during an emergency. The critical micro-scale of the evacuees' experience within the built environment (usually in deteriorated conditions after a tsunamigenic earthquake) is not commonly examined.

In this presentation we describe a study undertaken in the earthquake- and tsunami-prone Chilean city of Viña del Mar. By using a mixed-methods approach including computer models (for both flooding and evacuation), fieldwork, and questionnaire surveys for evacuation behavior, we overlaid the large- and micro-scale levels of urban analysis and compare their results. We discovered that Viña del Mar's macro-scale urban form is well suited for rapid tsunami evacuation. This, as the result of its orthogonal, dense and well-connected grid of streets, which provides short routes to high ground, increases redundancy, enhances orientation and promotes a better distribution of evacuees. Nevertheless, we also found that large portions of the city's population might experience serious difficulties as the result of the vulnerable location of residences and key urban activities and facilities. Moreover, for certain parts of the city significant differences were found between the evacuation times as predicted by large-scale analyses and those actually experienced by evacuees during recent emergencies. When examining the micro-scale conditions of these areas, we found a large concentration of built environment's vulnerabilities that might have affected the evacuees' performance, including design, maintenance and usage-related problems.

These findings pose significant implications for authorities, urban planners/designers and emergency managers, as they underline the necessity of refining current mitigation and evacuation strategies. This is particularly important in developing contexts such as Latin America and the Caribbean, as their built environments usually lack appropriate conditions for supporting rapid and safe evacuations.

4 TITLE: Science and Resilience: The Experience of Chile's Commission of

Research, Development and Innovation for Natural Disaster Resilience

Author: Juan Carlos de La Llera; Felipe Rivera*; Magdalena Gil; Ursula Schwarzhaupt

***Address:** Pontificia Universidad Catolica de Chile and CIGIDEN, Chile

KEY WORDS: Disasters, Science, Research and development, Innovation

ABSTRACT: The recent widespread wildfires in central Chile during the summer of 2017 brought again similar feelings to those experienced in the aftermath of the February 27th, Chile earthquake in 2010. It seems that over and over again this country needs to be continuously planning to face these incredibly powerful natural events. This was the motivation of the President to ask in 2015 to the National Council of Innovation for the Development to prepare a national strategy for natural disaster resilience. After this request, the Chilean Commission of Research, Development and Innovation (R&D+i) for Natural Disasters Resilience (CREDEN) was formed. The objective of this paper is to summarize the work of the Commission and to examine how its conclusions may show light about the role of R&D+i in natural disaster research worldwide.

The different sectors and stakeholders involved in the country's disaster resilience were represented within the over 60 members of CREDEN: academia, public and private sector, NGOs, and the armed forces. The result of the one-year work of CREDEN was the National R&D+i Strategy for Natural Disasters Resilience, which reflects on the role of science and technology in improving the overall resilience of the communities, and on the opportunity of creating a new disaster resilience industry of products, technology and services to boost the national economy. The strategy establishes a twenty-year roadmap to improve disaster resilience organized into fourteen R&D+i tasks together with five transversal conditions providing the adequate institutional framework and human and physical capabilities to support and further develop this strategy in time. The Commission estimated that the implementation of this strategy would require an investment of \$45.7 million USD annually, for a total cost of \$914.2 million USD. Additionally, a Cost-Benefit ratio of 2.32 was estimated for the strategy, meaning that for each dollar invested in the strategy, the country can save 2.32 dollars in hazards' related losses.

5 TITLE: Earthquake and Economic growth: An Economic Sector Specific Investigation

Author: Xian Xu*; Yao Xiao

***Address:** Fudan University, China

KEY WORDS: Earthquake, Economic Growth, Mechanisms

ABSTRACT: Natural disasters often lead to huge social and economic losses. However, the economic and financial impact of natural disasters might be negative in short-run, but positive in medium or long run. The rationale is despite of the large scale of damages; it demolishes the obsolete production facilities and draws an influx of investment and advanced technologies for rebuilding. In this paper, we use the earthquake data from 31 provinces in China from year 1991 to 2014 to empirically examine the impacts of earthquakes on short-run and medium-run economic growth. Our results show that the economic growth rate dropped 0.1% in the event year. However, in the next five years, earthquakes actually have positive effects on the economic growth in the affected areas with an increased growth rate at

0.15% in general. We also find that manufacturing sector (secondary) is the most heavily affected by earthquakes when compared to other economic sectors such as the raw materials (primary) and services (tertiary) sectors.

6 TITLE: Predicting Surge with Frequency Analysis to Assess Extreme Water Levels in Tidal Rivers

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KEY WORDS: Storm surge, Unsteady flow, Frequency analysis, Extreme water level, Overtopping flow

ABSTRACT: Storm surge related coastal flooding during typhoon events are mainly caused by high water levels as a result of a combination of astronomical tide and surge, and wave. Both are characterized by low atmospheric pressure systems and strong onshore winds, causing elevated sea level resulted in the risk of coastal flooding. Taiwan is an island country surrounded by the sea. There are about four typhoons hitting Taiwan in summer and autumn seasons every year. During a typhoon event, once the elevated water level over an embankment, the resulting in coastal inundation would lead to serious damage of properties and losses of lives. In this study, a two-dimensional ADCIRC (Advanced CIRCulation) model was applied to the Taiwan's Coast and a one-dimensional unsteady flow model (UFM) was adopted to simulate water levels in the tidal Danshuei River system of northern Taiwan. The two models were calibrated and verified against measured data during historical typhoon events. Further, five typhoon physical parameters including central pressure, maximum wind speed, radius of maximum wind, forward speed, and translation angle were systemically analyzed to estimate the probability density functions (PDFs). Based on the probability exceed of typhoon parameters to generate different synthetic typhoons. The validated ADCIRC model was then used to calculate different storm surge heights which were severer as the database for surge frequency analysis. Moreover, the storm surge heights of different return periods were then generated and determined. The validated one-dimensional unsteady flow model was then applied to predict the extreme water levels in tidal river system. We found that some locations in tidal river would exceed the existing embankment, resulting overtopping flow.

7 TITLE: Disaster Governance in Bhutan Amidst Democratization and Urbanization

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KEY WORDS: Democratization, Urbanization, Governance, Bhutan, Disaster

ABSTRACT: This study identifies the disaster governance challenges, institutional barriers and emerging roles of public policy makers in a newly democratized country undergoing rapid urbanization. The Kingdom of Bhutan demonstrates how the simultaneous processes of democratization and urbanization can compound barriers to effective disaster governance,

and pose challenges in the implementation of the Sendai framework on disaster risk reduction. Within the last five years, Bhutan has undergone major institutional changes to scale up and decentralize disaster management in order to address the emerging challenges of environmental and climatic-related disasters. A Disaster Management Act was passed in 2013, and planning guidelines are being developed at the district level. However, the relatively small size of the private and non-government sector raise further complexity in addressing disaster governance in a holistic way.

Based on fieldwork undertaken in August and September 2015, this research compares three cities in Bhutan, in terms of the varying perceptions of disaster risk, and the implications for disaster governance: Thimphu, the capital and largest city; Phuentsholing, a border city with Jaigon (India); and Paro, hosting the only international airport. Local documentation and primary data collected from in-depth interviews with more than 25 individuals including policy makers, development partners, local disaster management focal point, and mayors, have been systematically analysed using NVivo software.

The findings go beyond the case studies, and contribute to the literature on disaster governance and on the limitations of the implementation of the Sendai framework in three ways:

Identifying gaps in perceptions about disaster risks between citizens, local decision makers and academic research;

Contrasting the impact of the varying degrees of institutionalization of democratic processes between cities on disaster governance;

Given the rapid urbanization process, identifying new roles and responsibilities for policy makers, and local leaders to address vulnerabilities and disaster risk.

8 TITLE: GIS based Location and Layout Planning for Emergency Shelters in Mountainous Rural Towns —Case Study of Muyu Town, Shennongjia

Author: Zhouling Hu*; Yinghui Xiao*; Qingming Zhan*; Wenyu Dan*

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KEY WORDS: GIS, rural disaster, emergency shelter, location, evacuation simulation

ABSTRACT: As a large agricultural country, China has a wide range of rural areas, and due to existence of the urban-rural dual structure, infrastructure and public facilities in rural areas is relatively lag behind as compared with urban areas. The many rural towns are often located in remote and mountainous areas, and villagers usually lack of safety awareness. We often see that once natural disasters occurred, the lives and properties of people suffered seriously in rural areas.

Emergency shelters can not only be used for evacuation and rescue sites before and after the disaster, but also save life and provide emergency supplies. Thus, reasonable emergency shelter planning can effectively reduce the losses caused by the disaster. Based on the powerful spatial analysis functions of GIS software and geodatabases, this study takes into account the infrastructure, population distribution and disaster situations of rural areas, and layout locations and responsibility areas from the aspects of safety, timeliness, fairness and operational costs. Finally, based on the NetLogo simulation platform, this study develops an

emergency shelter simulation system with the multi-agent model to simulate the emergency shelters for crowd in a disaster situation, which provides a strong support for planning the appropriate evacuation routes and estimating the layout of emergency shelters.

Taking Muyu Town in Shennongjia as an example, we implemented the network analysis function of ArcGIS 10.2 software, starting from the evacuation demand points, and reaching the range within 15 minutes as the accessible areas of evacuation demand points along the road network, evaluating suitability of the shelter locations of these areas. The candidate emergency shelters in the suitable area are screened as potential shelters and then layout optimization and division of responsibility area are processed. At a late stage, according to the different effective areas, shelters are divided into three kinds: central emergency congregate shelter, resident emergency congregate shelter and emergency evacuation shelter. At last, simulating the emergency shelters of crowd in a disaster situation can improve their operational efficiency. It shows that the emergency shelters can cover more than 95% of the population within 15 minutes when selecting the shortest paths. Compared with the traditional methods, this method is considered much more efficient and can also provide a demonstration case for planning emergency shelter in rural areas.

9 TITLE: Physical Impact Assessment of Flash-Flood Hazard in Small Island Developing State: Case Study on St. John's and Gouyave Watershed, Grenada

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KEY WORDS: Physical impact assessment, flash-flood, small island developing state, land use, building, Grenada

ABSTRACT: Grenada is part of small island developing states in Caribbean region. It is located between the Caribbean Sea and North Atlantic Ocean. This state has a tropical climate which triggers high-intensity rainfall and hurricanes. As a consequence, Grenada is often hit by floods, specifically flash-flood. Flash-flood leads high damages on physical infrastructures, economics, and casualties. Physical impacts, which are essential to estimate potential economic losses, are deemed as crucial in flood risk reduction. Nevertheless, there are very few studies that assess this impact in Grenada. This paper aims to assess the different physical impacts of flash-flood on St. John's and Gouyave watershed. St. John's represents an urban area which is more densely populated and difficult to be managed than Gouyave watershed, a representative of the rural area. This study is conducted by using a quantitative method by classifying land-use with visual interpretation, using a result of OpenLISEM flood modeling to derive information on flood depth and extent areas on different return periods, and assessing physical impacts which focused on buildings and land-use types with GIS-based overlay. The results show that (1) built-up areas in St. John's (23.28%) is higher than Gouyave watershed (5.53%). (2) There is no flood in 2-year return period, but in 35 and 100-year return period, St. John's watershed has higher maximum flood depth and flood extent areas than Gouyave. (3) Total numbers of building exposed of St. John's in 35 and 100-year return periods (216 unit and 267 units) are higher than Gouyave watershed (61 units and 184 units) and (4) Built-up areas are the most land-use types that are affected by flood on

those two watersheds in 35 and 100-year return periods.

10 TITLE: Fire station layout for village based on GIS network analysis —case study in Muyu Town Shennongjia

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KEY WORDS: fire risk evaluation, Town, fire station layout, GIS analysis

ABSTRACT: The layout of fire station is one of the main problems in fire protection planning, however, related research and practice in this field usually focuses on urban area. Fire protection, regarding to the vast area and complex environment of villages, has been overlooked, and fire station layout designed by traditional method cannot meet the increasing need nowadays. So it is necessary to study evaluation and optimization of fire station layout quantitatively.

In this paper, with the study of local fire risk through passive fire protection capacity and local fire fighting ability evaluation, optimized fire station layout based on travel time of fire vehicles, and accessibility measured by accessible building area ratio are conducted about Muyu Town in Shennongjia by using GIS analysis tools. Research shows that: 1) High and relatively high risk area are lower than 10%, but are distributed around major hazard installations, where will take more than 3min for fire vehicle to reach.2) Compared and analyzed the results of current location chosen by traditional method and the method based on road network and network analysis in GIS, the method based on network analysis in GIS will improve the layout of fire stations by reducing the blind spots and average travel time of fire vehicles to reach high and relatively high fire risk area. In the end, on the basis of the analysis result and the actual cases study, an optimized adjustment scheme is proposed.

This research is funded by the National Key Technology Support Program (No. 2014BAL05B07)

11 TITLE: Application of CBR in Planning Support Decision-making System

Author: Xiaoxu Xing*; Qingming Zhan; Yinghui Xiao

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KEY WORDS: artificial intelligence, case-based reasoning, Geo-disaster, land use

ABSTRACT: In the traditional decision-making process of disaster prevention and mitigation planning, the rural planning schemes often ignore the potential hazards induced by various coupling factors, even the planning decisions are limited. With the growing of data mining in the field of artificial intelligence, it's possible that case-based reasoning (CBR) solves the problem of complex areas or incomplete knowledge. To solve the new problem, this system can search its own case library to find the decision-making and the consequences in the history, so that people can make reasonable solution. On this basis, the author used CBR to solve the problem of geospatial and discussed the specific expression form and reasoning model according to the characteristics of geographical case.

The aim of this paper is to predict the location of potential geological hazard spots in Shennongjia, through the specific case that contains the basic information of geological

disasters and construction of land use in the history. The main contents are as follows: Firstly, filtering data based on the screening principle of case library and defining the expression of the case. Then determining the similarity calculation method according to the type of the case attributes. Reusing the search results with high similarity and calculating the potential danger point position in the development process according to the similarity and the relative distance. Finally using ArcGIS secondary development platform for visual display to help the planning decision-making in town of integrated disaster prevention and mitigation.

This research is funded by the National Key Technology Support Program (No. 2014BAL05B07)

12 TITLE: Study on the Accessibility Evaluation of Emergency Shelters in Rural Areas based on Network Analysis and Buffer Analysis -- Case Study of Songbai Town in Shennongjia

Author: Wenyu Dan*; Yinghui Xiao; Qingming Zhan; Zhouling Hu*

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KEY WORDS: rural emergency shelters, network analysis, buffer analysis, accessibility

ABSTRACT: Emergency shelter accessibility refers to the difficult degree of reaching emergency shelter through evacuation routes, which can be used to evaluate the reasonable spatial distribution of the shelter, in order to improve the layout planning of rural shelters. Many rural towns are usually located in remote and mountainous areas, and villagers often lack of safety awareness. So the correct guidance to the shelters in the shortest time can reduce unnecessary casualties and improve the efficiency of rescue evacuation. The methods used to research accessibility contain buffer analysis, proximity distance, gravity model approach, travel cost method and network analysis. Network analysis based on road network, is more in line with the rural actual terrain, compared to other methods, the network analysis results are more accurate and objective. At the same time, the rural areas are sparsely populated, while more open space (farmland, wasteland, etc.), in the event of the disaster, the villagers tend to go straight to escape. In this study, the network analysis and the buffer analysis are combined to evaluate the accessibility of emergency shelters in rural areas and puts forward the layout optimization strategy.

Taking Songbai town in Shennongjia as an example, Arc GIS 10.2 software is used as the operating platform. Based on the average walking speed, firstly, the network analysis tools and buffer tools were used respectively to analyze the accessibility of 5 min, 10 min, 15 min, 20 min, 30 min for the emergency shelters planned by Songbai town. Then, we combined with the two methods, according to the specific terrain of Songbai town, taking a network service area analysis of the shelters in the building-intensive areas, and taking a buffer analysis of the shelter in the open areas. Finally, the results of these three methods were compared and analyzed from three aspects: the coverage area of the shelter, the population and the per capita refuge area. In addition, the accessibility of emergency shelters in rural areas should pay more attention on the guiding role of the evacuation sign system, and make the villagers have in-depth knowledge of shelter and evacuation path through the government publicity and education. So as to enhance the accessibility of emergency shelters from both psychologies and behaviors of refuge seekers.

Acknowledgement

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13 TITLE: An Urban Nexus-based Approach to Critical Infrastructure Protection

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KEY WORDS: Critical infrastructure protection, Infrastructure networks, Critical resource circulation, Nexus-based approach, Systems approach

ABSTRACT: The critical infrastructure protection (CIP) has become one of the most important obligations of every nation to sustain its growing urban areas and economy. In the past, most infrastructure systems were stand-alone facilities that are physically independent and geographically separate. The corresponding objective of the CIP is to prepare and respond to incidents of terrorist activities and natural hazards and to prevent the facilities from breaking down. With trends in urbanization and advances in technology, however, the infrastructure systems has evolved into various infrastructure networks, for example, a power plant evolves into the power grid, that become integral and inseparable parts of the complex urban nexus. While this increased reliance on interlinked capabilities helps make the circulation of our critical resources, e.g., food, water, energy... etc., more convenient and perhaps efficient, it also makes the urban nexus more vulnerable to disruption and failure. An incident that would have been an isolated failure can now cause widespread disruption because the circulation of resources is interconnected and interdependent. One catastrophic failure in one sector now has the potential to bring down multiple systems that support the circulation of our urban nexus.

In this research, we propose that a disaster comes in as a disturbance to the circulation of the nexus and a part of the long-term societal development. Thus, the objective of CIP is to protect not only the physical 'infrastructure,' but all assets or resources that are deemed 'critical' in the sense that the services or utilities they provide are vital to a city or the nation as a whole. A better concept of CIP would be redefined as strategies to ensure the circulation of critical resources rather than the protection of critical infrastructures alone.

14 TITLE: Enhancing Urban Resilience towards Water Sufficiency during Extreme Weather Disastrous Impact: A Sectoral Sustainable Action Plan of Quezon City, Philippines

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KEY WORDS: Disaster impact analysis, Urban Resilience, Extreme Weather, Urban water sustainability

ABSTRACT: After super Typhoon Haiyan hit central Philippines in 2013, access to safe and clean water and to sanitation were pressing concerns for survivors. Total damage for the

public water sector was estimated at US\$69.8 million, with almost 86 per cent of the costs due to damages to private household connections, equipment and operations loss. To prevent these kinds of catastrophic impacts, this study aims to assess extreme weather event impact in the urban water sufficiency and make sectoral sustainable development action plan. The exploratory research method was applied. Primarily, Logical Decision for Windows (LDW) software tool was applied to select the pilot urban LGU. The LDW result revealed Quezon City (QC) as the pilot LGU of this study. The participatory process and Geographic Information System were used to collect the pertinent data and in assessing and analyzing QC relative vulnerability, hazard exposure, risk and coping capacity. The technical analysis of the data collected revealed that the extreme weather event (100 year return period) will impact sustainability of City water resources; availability of clean, safe, equitable, and affordable water; and ground water potential. Thus, a sectoral action plan 2017-2027 of QC is developed to enhance its clean water and sanitation resiliency. The action plane includes, goals, strategies, office /department responsible, indicative budget and time-frame to execute proposed sectoral (Social, Economic, Environmental, Land Use/ Infrastructure, and Institutional) Programs Projects and Activities (PPAs) for urban water sustainability. Indeed, once QC sectoral action plan fully implemented it will enhance the urban communities' resiliency towards, extreme weather impact on clean water sufficiency and to sanitation. The methodology and action plan can also be used in context of other climate priority areas such as food security, ecosystem and environmental stability, human security, climate smart industry and services, sustainable energy, and knowledge and capacity development.

15 TITLE: Framework Scientific-Policy based on Risk Governance to Climate Change Adaptation

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KEY WORDS: risk governance, Vulnerability, climate change, framework scientific policy

ABSTRACT: Latin American cities are vulnerable to potential climate change impacts. To date, there is not enough understanding of which actions could be designed and applied in cities to reduce their susceptibility. An adequate climate change risk management has to address vulnerability and building capacities to climate change adaptation. In this context. An Analytic-Deliberative governance model is proposed to reduce climate risk, based on the implementation of a scientific-political interface that allows for linkages between Reduction Disaster Reduction (RRD) and Climate Change Adaptation (CCA). The model consist of: a) vulnerability analysis of hydro- meteorological hazards; B) development of a scientific-policy framework to contribute to climate change adaptation; C) characterization scientific-policy of institutions related to disaster risk management and climate change adaptation, to order to development strategic sectors d) Identification and establishment of links between disaster risk management and climate change adaptation through exploration of how scientific knowledge and policy could interaction. Definitely, the model looks for generating process on information co-constructions and risk decision making, where academics, government sector, specialized NGOs and organized civil society participate.

16 TITLE: The power of Art as vital role for creative recovery from disaster: Cases from Christchurch, New Zealand and Melbourne, Australia

Author: Junko Otani*

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KEY WORDS: art; Christchurch earthquakes; Victoria bushfires

ABSTRACT: This presentation will report the power and roles of arts for recovery from disaster, examining the examples from the 2011 Canterbury earthquake in New Zealand and the 2009 Black Saturday bushfires in Australia.

Following the 2010-2011 Canterbury Earthquakes, when the rebuild of the city cannot be said reasonably rapid, the temporary arts are what characterize the city of post-earthquake Christchurch. The arts do not only comfort people's feelings after overwhelming sense of loss but also provide the place for people to come out and gather. People come out to look for a new temporary art in the devastated land, and brings a light of hope. According to the Canterbury Wellbeing Index (2014), 90% of people in Christchurch answered that the arts takes vital role for the reconstruction of the city. It could also bring in revenue in tourist industry.

The Christchurch examples include Gap Filler Blue Pallet Summer Pavilion, Tree House for Swamp Dwellers by Julia Morison, artist in Christchurch, Performing Arts Precinct, Ballet dancer painting on the wall, the Transitional Cathedral by Japanese architect, Shigeru Ban, and the container shop "Re: START" project started in CBD in October 2011.

The Lyttleton example of the temporary park with couch to sit and Mosaic art on the ground, made by children, made of broken pottery and dishes, design of people hands-in-hands.

The Black Saturday bushfires were a series of bushfires in Victoria State of Australia on and around Saturday, 7 February 2009, which killed 173 people, and 414 were injured. Five years on, the blacksmiths tree was installed in Strathewen on Valentine's Day, 14 February 2014. Post boxes made of mosaic art made of broken pottery after disaster, with wishes for rebirth, while carrying their precious memories from the days before. Other countries can learn from these experiences, activities, and attempts from New Zealand and Australia.

17 TITLE: China's Pairing Support Method (PSM) as a post-disaster recovery strategy

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KEY WORDS: post-disaster recovery strategy; Pairing Support Method (PSM); comparative study

ABSTRACT: Pairing Support Method (PSM) is a method that has been used as an economic development policy in China since the 1970s. It is a mechanism for provinces and directly-controlled cities that are relatively developed economically and can provide one-to-one support to other regions that are lagging behind (Otani, 2015). PSM has been applied in various fields such as economics, education, medicine, and science technology. It has been highly evaluated for its effectiveness and efficiency, especially for its application on the 2008 Wenchuan Earthquake Recovery Project in Sichuan, although it also has numerous drawbacks in need of improvement. PSM is also called one-to-one support method, the idea

of which has been applied in other countries as a post-disaster recovery strategy. For example, in response to the 2011 Great East Japan Earthquake, a counterpart aid program was proposed and implemented in Japan to a limited extent.

Most prior research on PSM focuses on its application in one project in China by presenting a case study. However, there is a lack of existing research on the analysis of how PSM works as a post-disaster recovery strategy in China and no comparative studies on its application in other countries as a post-disaster recovery strategy.

The purpose of this paper is to develop recommendations on external assistance for better post-disaster recovery and reconstruction through document analysis of the application of PSM as a post-disaster recovery strategy and a comparative study of various actions that were effective in several countries regarding disaster relief and recovery.

18 TITLE: The “Community” in Community-based Reconstruction Projects: Lesson Learnt from Nepal Earthquake 2015

Author: Lai Ming Lam*

*Address: Osaka University, Japan

KEY WORDS: Community participation, Nepal earthquake 2015, Post-disaster reconstruction, Community-driven housing project

ABSTRACT: Community participation has been widely recognized as an important factor to more likely successful post-disaster reconstruction projects. This assumes that local share the same goal and they will act collectively to maximum their individual interests. The assumption takes collective action for granted and ignores challenges the individual may face in the post-disaster period which may adversely affect their community involvement. It also reflects community participation is just another fashion word used by NGOs and government officials, the indepth understanding of how community works in post-disaster time is absent. Being directly involving in a community-driven housing project led by the grass-rooted NGO Future Village after massive 7.9 magnitude earthquake 2015 in Nepal over two years, in this paper, I will discuss the challenges of promoting community participation in each reconstruction stage. The experience has demonstrated that the role of community participation has different stages, without clearly identify the advantages and limitations of community participation in different stages, the practice of community participation is limit. Through the time passes, the level of trust and reciprocity among the community as well as their future plans are continuously changed, as a result the community rebound will be undermined. More importantly, I argue that the risk of romanticization the power of community and lack of attention to create trustful relationship between different stakeholders will weaken the overall effectiveness of community participation. Indeed, community spirit and participation need to be nurtured.

19 TITLE: Flood warning system of Tamsui River using ensemble rainfall forecasting

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KEY WORDS: flood, Warning, Tamsui, River, ensemble, rainfall, forecasting

ABSTRACT: On the average, there are 3 typhoons striking Taiwan which usually induce high water surface level in the rivers and sometimes induce overbank floods. To accurately predict water surface levels in the rivers during typhoon seasons is vital for disaster reduction. This study adopts a semi-distributed, parallel-type, linear reservoir conceptual runoff model, a hydraulic routing model, and a storm surge model to form a flood warning system of Tamsui River in northern Taiwan. In the past, the water surface level of the river mouth of Tamsui River during typhoon's striking is estimated by an empirical equation that calculates the storm surge deviation from the central pressure of the striking typhoon and combines it with the results of harmonic analysis. A Semi-Implicit Eulerian–Lagrangian Finite-Element model, SELFE, was used for the storm surge simulation around Taiwan. The wind field of SELFE is given by a Weather Research and Forecasting (WRF) model.

The ensemble rainfall has better accuracy of the typhoon track and rainfall forecast when comparing to any single model. The ensemble rainfall of this warning system is provided by Taiwan Typhoon and Flood Research Institute (TTFRI) which runs 26 weather dynamic models simultaneously and the ensemble forecasting is derived from it. It can provide a lead-time of 72 hrs. simulations four times a day. The ensemble rainfall is then used for the input of rainfall-runoff model (RR) for producing discharges. The upstream boundary of Tamsui River is provided by RR model and the downstream boundary of the river model is set by the storm surge model. Thus, an integrated flood warning system of Tamsui River using ensemble rainfall forecasting is established. The computation result is shown on a web-based platform and the real-time CCTVs can also be seen on it. With this system, the water gates along Tamsui River can be closed timely to prevent water flooding from the flood plains to the city. There are many cars parked in the flood plains outside the levees of Tamsui River, and the authority can warn the owners of them to evacuate their cars in advance. The water surface level forecasted can help to issue warnings to possible over-bridge-deck events.

20 TITLE: Measuring Disaster Recovery Progress from Community Cognition: A study on Cyclone Aila Recovery in Koyra, Bangladesh

Author: Md Shibly Sadik*; Hajime Nakagawa; Md Rezaur Rahman; Rajib Shaw; Kenji Kawaike; Kumiko Fujita

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KEY WORDS: Cyclone Aila, Disaster Recovery, Disaster Risk Reduction, Lesson Learnt

ABSTRACT: Historically, Bangladesh has a long experience with cyclone disaster. The country has made an exemplary success of saving lives from the cyclone. Though Bangladesh has shown a paradigm shift from post-disaster response to pre-disaster preparedness, mainstreaming the disaster risk reduction in the development process through recovery work is still a long way to go. This research investigated the post-disaster recovery of cyclone Aila considering a coastal Upazila, Koyra as a case study site. Since the Aila hit in 2009, the international humanitarian organizations and the Bangladesh government have been providing an intensive support for recovery. The newly established Early Recovery

Facilities of UNDP coordinated recovery programs of humanitarian organizations. Since the concept of post-disaster recovery is still in developing phase in Bangladesh context, this academic research has been designed to examine the ongoing recovery from a context of Build Back Better. In this research, a participatory method was adopted and a series of Focus Group Discussion was conducted to measure recovery progress by analyzing the cognition of the participants. While conducting FGD, cognitive contents which participants were mentioning and discussing to agree on the status and recovery of different sectors were documented. Finally, from the score based perceptions of the community, recovery progress curves were constructed for different sectors e.g. physical safety, infrastructure, economy, sanitation, disaster preparedness, etc. Results clearly show a trend of development in most of the sectors. Whereas, the lack of disaster risk reduction measures and poor condition of coastal embankment prevail. This raises a strong concern in the community for the possibility of similar prolonged suffering from a recurrent cyclone in future. The results also suggest that the coastal embankments are once again becoming the central focus in the recovery which alarms a possibility of raising a false sense of security within the community.

21 TITLE: Research on urban flood warning system design and its application

Author: Wang Zhe*

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KEY WORDS: rainfall threshold; flood disaster events; urban flood warning system

ABSTRACT: Nowadays, various city flood disasters broke out more and more frequently in our country. The situation which is due to the accelerating urbanization process and the deteriorating climate has brought great obstacles to the development of cities. Furthermore, it has caused great threat to the residents' life and property security, even brought a great inconvenience to residents' daily work and life. Under the background, academic circles pay more and more attention to the safety of urban flood problems.

The paper aims to improve the accuracy of urban flood warning system. With the rainfall reaches the alert value, the warning information is given to government for treating flooding damage which may happen. According to such events, the statistical approaches are adopted to calculate the optimum rainfall thresholds. The results are applied to enhance rainfall thresholds forecasting accuracy, and could enhance the urban flood warning system.

22 TITLE: Discussion on Exhibition Representation in Chinese Disaster Museum

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KEY WORDS: disaster museum, Exhibition, memory, the Sichuan earthquake

ABSTRACT: A mega-earthquake struck Sichuan on May 12,2008. Actually, China has seen many earthquakes in its history due to its geographical features. However, it is worth mentioning that experiences and pain through the earthquake experiences had not been

generally shared well before the Sichuan earthquake. Disaster museums have been established in China since 2009, with an attempt to exhibit not only the report of damages and but also the process of reconstruction and to keep the memory of the disaster in Sichuan. This paper aims to clarify the issues of disaster museums in terms of presenting the exhibition and people's memory by taking Beichuan a case. Due to the serious damages and the high-risk of secondary disaster, the Chinese government was determined to construct a new area to relocate residents, instead of reconstructing the Old Beichuan; in addition, the government preserved the Old Beichuan as a specialized research place and established 'Beichuan National Earthquake Ruins Museum (BNERM).

Gao conducted observation and semi-structured interviews in Beichuan areas in June 2014, August 2015 and March 2017. The interviewees included disaster survivors, tourists and the staffs of the BNERM. My research question is "How exhibitions at the disaster museum represent the memory of the disaster?" The exhibitions are constructed with educational value, as well as moral, emotional and political elements. The stories told by the exhibition of ruins are constructed more with negative fearful images such as 'destruction', 'fear', and 'sadness', rather than 'lessons from disaster'. Exhibitions of rescue and reconstruction shown from public perspectives are positive. For some visitors, it is considered that there is a lack of reminding the 'lessons from disaster' in terms of the expression of the exhibition. To express memories of disaster from various perspectives, it is indispensable to consider a private viewpoint. "Memories" in BNERM were, almost exhibited from public perspectives; however, personal memory is "lacking", which could be lost forever.

23 TITLE: Development of New Approach in Determining the Optimum Number of Relief Operation Centers

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KEY WORDS: Disaster Relief Operation, Relief Operation Center, New Approach, Center of Gravity Method, Marikina City

ABSTRACT: In the recent year, the Commission of Audit pointed out some problems in disaster relief operations such as lack of facility for the procured supplies while waiting for repacking. The location and the number of relief operations affect the way the relief items are being distributed to the beneficiaries. Actions and decisions within 72 hours to the areas affected is crucial to ensure effective and timely response to the victims of disaster in order to reduce mortality, life threatening morbidity and disability [1].

The study aims to develop an approach in determining the best locations and the number of relief operations centers. The propose approach integrates the center of gravity method of the geographic area being considered and the capacity of the relief operations centers. Variables to be considered are distances of destinations, volume to be shipped and capacity of the relief operations centers. The method requires simple task to implement for the determination of the number of relief operations centers. The novelty of this approach is that it combines the calculation of the optimum number of facilities as a function of its maximum capacities and with respect to the overall demand and continued in identifying the optimum locations of

facilities with consideration for multiple facility requirements.

The method was applied to Marikina City one of the cities in the Philippines that are often experiences sudden and slow on set floods and is one of the areas in the fault line.

The results showed that two relief operation centers would enable the city to deliver the goods in less than 72 hours. This is in comparison with the location and capacity of their existing one relief operations where it reflected that it cannot yet deliver the total demands of relief items to the affected families within 72 hours after disaster strikes. With the use of the proposed approach, it is possible to determine the minimum time to locate the affected areas to save lives.

24 TITLE: Comparison of two flood areas, char and inland, in Bangladesh: Implication for Japanese hazard mapping technology

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KEY WORDS: Bangladesh, Flood, hazard map, char

ABSTRACT: Flood is a critical issue in Bangladesh, with the most severe occurring during July and August. Regular floods affect 20% of the country, increasing up to 68% in extreme years. In 2004, Bangladesh experienced devastating floods lasted from July to September, and about 38% of the country were inundated. After this flood, there was a shift from focusing on response and relief to preparedness. All stakeholders' participation was also considered to be effective, and the needs to improve disaster response and preparedness at local level were also focused.

Since Japan also suffers from floods, measures have been developed. Same as Bangladesh, measures were shifted from structural measures to comprehensive measures including non-structural measures. One of a major non-structural measure is hazard map for warning and evacuation. Some of Japanese measures are applicable by adjusting them to fit the selected area's condition, technological and social background. In this research, two flood-prone areas, char and inland, were selected in the Jamuna River basin for comparing and analyzing the possibility of transferring hazard mapping technology. Chars are sandbars emerging as islands within the river channel (island chars) or as attached land to the riverbanks (attached chars). Chars are unstable because they are developed by erosion and accretion. Some chars exist several decades but others have short histories. Inland in this research means not char area, which is stable and not affected by riverbank erosion, however affected by flood. Semi-structured interview and questionnaire survey were implemented in Gaibandha District. Followings are the major results. (1) Since inland area is protected by government, embankment is maintained and land shape do not change often like char. (2) Respondents in inland are more interested in warning when they evacuate. Therefore, there is higher needs and possibility to use hazard map in inland area than in char area.

25 TITLE: Assessment of Banks Reiliency in Natural Disaster through Business Continuity Management Plan

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KEY WORDS: Banking Resiliency, Natural Disaster, Business Continuity Management Plan

ABSTRACT: The Philippines is one of the most storm-exposed country in the world. Natural disasters already account for more than 0.5 percent of gross domestic product (GDP) annually (World Bank, 2010). With this, continuity of business operations is vital in resiliency in case of a natural disasters. Most banks address the issue with the organizational focus on strong technology and facility infrastructure (Rai, 2006).

Last March In 2017, incoming BSP governor issued a circular requiring banks to have a Business Continuity Management Plan in case of a Natural Disasters. This study aims to assess the current state of the Business Continuity Management Plan of the Banks in flood prone areas and places within the earthquake belt. Assessment is based on the following variables: Banks standard practices, Resumption and Recovery objectives, Secondary site, Dependence of third party providers, and Crisis communication management. This approach validates the readiness of banks in case of a Natural Disasters. It will be applied in Cainta one of the municipality located in the province of Rizal that often experience flooding and also within the earthquake belt.

The results state the lack of readiness of banks to have secondary site that will continue operations. Also, it shows the inability of the banks to resume operations within hours after a major natural disasters as past experience indicates that it took banks weeks and some months to return to normal operations. With the present of the propose Business Continuity Management Plan for Banks for Major Disaster it will improve the number of hours or days for the banks to resume operations after a disaster.

26 TITLE: The Influence of Disaster Risk Reduction Agencies' Collaboration on Elementary Schools in Sichuan, China

Author: Yixuan Chen*

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KEY WORDS: disaster risk reduction education, elementary school, collaboration

ABSTRACT: This paper addresses the influence of the collaboration of agencies, such as academic institutions, NGOs and international organizations engaged in disaster risk reduction education (DRRE), on disaster risk reduction education in elementary schools in Sichuan province of China through an analysis of changes between the situation before the 2008 Sichuan earthquake and that of today.

Disaster risk reduction education is a crucial part of a social risk management system, and much research has been done in several fields. However, many previous studies focus on quantitative analysis of the effectiveness of educational materials, and, whether in China or other countries, qualitative studies on DRRE often focus on the function of a single agency, while lacking the consideration of multiple agencies' collaboration. Based on the literature review, four research questions are designed: 1) After the 2008 Sichuan earthquake, how did

DRRE change in Sichuan's elementary schools? 2) Comparing before and after the earthquake, what changes occurred in agencies engaged in disaster risk reduction education in elementary schools? 3) How do different agencies affect DRRE in elementary schools? 4) What problems does collaboration pose for these agencies?

The research employs a qualitative study through a literature review, interviews, and participant observation to realize its objectives. To gather data, interviews with two headmasters (one from a city area school and the other from a rural one), and a one-month participant observation in a disaster risk reduction NGO were conducted.

The data lead to 2 changes in elementary schools' disaster risk reduction education: education materials and activities. The data also indicates that more and more agencies have stepped into

disaster risk reduction education after the earthquake. In addition, different agencies influence

disaster risk reduction education in elementary schools in different ways. Most significantly, the collaboration of agencies brought about a dramatic change in disaster risk reduction education. However, three problems remain: 1) disseminating mature excellent experience, 2) matching supply and demand based on local situation, and 3) turning an input into an output.

27 TITLE: Policies and Institutional Framework for Disaster Risk Governance – a case of 2015 Myanmar Floods

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KEY WORDS: Flood, Disaster Governance, Disaster Risk Reduction, Institutional Framework.

ABSTRACT: Hydro-meteorological or climate induced natural hazards are exponentially increasing its impacts with the increased exposure of the people and socio-economic conditions. By virtue of its geo physical conditions, Myanmar is vulnerable for multiple natural hazards i.e., cyclone floods, drought and earthquakes etc. As described in World Risk Report 2012, Myanmar has World Risk Index (WRI) of 9.15, which is considered as high risk. WRI is based on 28 indicators and is the product of exposure to natural hazards and the vulnerability of society that can provide insight on whether the occurrence of an extreme natural events can result in a disaster.

Institutional framework and policies pertaining to Disaster Risk Governance mechanism are playing a significant role to guide the administrative systems of the central and provincial governments. Risk management Policies and legislations are paramount components towards defining the efficiency of the on-ground implementation of the plans. The study principally examines the efficacy of the disaster management policy and plans and its implications in Myanmar in the context of 2015 heavy rainfall and floods, which impacted a wide geographic area with a long term socio-economic consequences. The study will also highlight the role of recently formed democratic government in Myanmar and related challenges in the perspective of 2015 Monsoon flood disasters. Comprehensive review of the published literature on the institutional mechanism at the national, provincial and local levels for the disaster risk governance for Myanmar, multi-hazard impacts and Emergency Humanitarian

Response during 2015 disasters showing the concern in crisis management / emergency response and the associated issues of the Cognition, Communication, Coordination and Control.

28 TITLE: Sister Village : A Disaster Risk Reduction Concept based on Local Indigenous in Magelang District

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KEY WORDS: Sister Village, Camp Management, Disaster Risk Reduction

ABSTRACT: Purpose – Mount Merapi is the most active volcano in the world which mostly erupted once in 2 - 7 years. Facing the permanent hazard caused by the volcanic eruption, a proper and effective model of camp management need to be prepared as a mitigation activities in both structural and non-structural. Improper camp management as happened in 2010 has caused secondary hazard which increased numbers of casualties during stayed in provided camps. Inspired from the indigenous knowledge on dealing with volcanic eruption, government of Magelang regency established Sister Village policy that mentioned in local regulation of Magelang district number 07 of 2014. This research will analyse Sister Village concept which having developed in Mount Merapi areas.

Methodology – This research used qualitative approach, particularly case study and focused on Magelang district.

Result – Sister village is a concept on disaster risk reduction that bridging a village with high potential hazard with two or more surrounding villages that will be taking role as safe haven. Sister village is not only moving the high risk village citizen to the safer village, but also build their livelihood and making both refugees and local citizen prosperous together. This concept refers to ‘Gotong – Royong’ concept and Muhajirin – Anshar Concept when Prophet Muhammad moved from Mecca to Medina. Trough this research, the sister village concept is expected to be a refference that might be used by any related stakeholders on managing the camp in better and proper way when the disaster occurred.

29 TITLE: Adapting Disaster Risk Reduction Tools to Support Indigenous Resilience: A Case Study in the Strait of Georgia

Author: Michelle Marteleira*

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KEY WORDS: Indigenous Resilience; Disaster Risk Reduction; Risk Governance

ABSTRACT: This paper investigates the current challenges for disaster risk reduction planning across First Nations communities (Indian Bands) in Canada and explores ways that tools can be adapted to improve regional resilience efforts. It is clear that institutional gaps exist in disaster risk reduction planning between Bands and other local governments in Canada, leading to increased risk among First Nation populations. Colonial policies, such as the reserve system, have forced communities to live in areas with greater exposure to hazards, while the jurisdictional power of the federal government over Bands makes collaboration with other local governments difficult. Natural hazards often have regional impacts, so

interjurisdictional collaboration should be an important feature of resilience building. Shared and adapted disaster risk reduction tools are a way to encourage this regional cooperation and build stronger relationships. Through a case study with the Musqueam First Nation, this project identifies methods for adapting a coastal resilience tool (the Resilient-C platform) and proposes recommendations for future collaboration efforts.

How can disaster risk reduction tools be adapted to meet the needs of First Nations planning contexts in Canada? Interviews with staff from several departments of the Musqueam Band administration were conducted in 2016 to explore this issue and gain insight on the current challenges for implementing disaster risk reduction efforts. This research helps to build a framework for developing and adapting tools to meet the needs of Indigenous communities and supports comprehensive approaches for resilience planning. The report concludes that regional resilience efforts must include Indigenous communities through communication, cooperation, and collaboration, to make disaster risk reduction more effective and equitable across Canada.

30 TITLE: Governmental Steering in the Market Dynamics to Ensure Environmental Risk Management : focused on the Mandatory Environmental Liability Insurance System in Korea

Author: Boram Hong*; Seulki Hong*

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KEY WORDS: Environmental Risk, Mandatory Insurance Policy, Environmental Liability and Relief Act

ABSTRACT: The purpose of this paper is to analyze the governmental approach to manage environmental risk, focused on the meaning of newly enacted Environmental Liability and Relief Act in Korea. This Act have introduced mandatory liability insurance scheme for relevant industrial facilities. To make society more sustainable, each participant - individual, enterprises and government - play one's cards in various fields. Due to the bounded rationality, however, social actors do not focus on social problems which call for long-term perspective solutions. In particular, each individual pursues his or her interest in short-sighted ways and he or she does not have enough capabilities to predict accurate risk in the foreseeable future and to estimates gains and losses when the risk realizes. Corporations, too, are not free from these problem. Owing to the short-sighted nature of the social actors, - which are often called the 'tragedy of commons' - from time to time public authorities need to take 'governmental' approaches to deal with social problems that must be addressed in the mid to long term frame. Among many of the challenges which our society faces, environmental issues should be approached with longer time-frame. To ensure the sustainability and prosperity of our society, myopic benefit-cost calculation should to be re-adjusted. The way Korean society had adopted an innovative insurance policy could be understood in the light of public and private partnership. Social concern about the drastic consequence of environmental accident in 2012 exerted pivotal influences in policy agenda-setting. And Korean government played a leading role to introduce the new policy which reinforces strict liability and oblige business owners to buy insurance cover. By making people equipped with enhanced risk management tool, government complements

bounded rationality of social actors, and political stream bolstered the legislation. This paper could provide rather confined but still meaningful understanding for those who want to look into the policy process and tools of environmental policy tools.

31 TITLE: Zoning Earthquake of Mashhad Urban Fabric by Quantitative Models

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KEY WORDS: Geographic Information System (GIS), Quantitative Models, Mashhad Urban Fabric, Earthquake Risk

ABSTRACT: Here, vulnerability levels of urban fabrics was determined against earthquake risk using spatial factors. Parameters such as ratio of open spaces, size of lands differentiation, occupied area by buildings, age of buildings, deteriorated urban fabrics, and seismic grading, were used to classify risk vulnerability zones of the Mashhad urban fabric. These parameters are derived based on Mashhad municipality districts then weighted by Analytic Hierarchy Process (AHP) and combined by the Standard Score Model in geographic information system (GIS). The results indicated that: first, the central district and districts of eight, three and four in Mashhad have the most fabric vulnerability against earthquakes, respectively. Second, the urban texture of municipal districts containing districts of nine, seven, six and ten have less vulnerability against earthquakes, respectively. Third, the parameters analysis using AHP exhibited the weighty value for lands differentiation parameter while, the correlation test revealed that the strong correlation between deteriorated urban fabrics and the final zoning map (R^2 equal to 0.75). At the present study, we used the eight parameters for earthquake vulnerability zonation. Our aim was to identify the urban fabric susceptibility of Mashhad against earthquakes by combining the AHP and the standard score models. The results revealed that Mashhad CBD and districts of 8, 3 and 4 of Mashhad municipality have the most fabric vulnerability against earthquakes, respectively, while the urban texture of the municipal districts of 9, 7, 6 and 10 have less vulnerability against earthquakes, respectively. The used methodology could be applied for urban risk management in the Mashhad City.

32 TITLE: How Public-Private Participate in Disaster Reduction and Prevention

Author: Wu-Chueh Hung*; Yi-Chi Tan*; Jing-Yuan Chiou

***Address:** National Taiwan University, Taiwan

KEY WORDS: Disaster Reduction, CSR, Flood-Prone Community

ABSTRACT: Taiwan is the most vulnerable area to natural hazards (World Bank, 2005), how to make sure the residents can be safe is the most important thing during the flood and typhoon period. We should combine government, residents and businesses to reduce disaster risk and protect our lives.

Different from government and non-governmental organization, enterprises participate in disaster emergency response can not be limited by law and procedure, through their

technique, specialty and resources to assist the disaster recovery of affected areas at first timing that only need the consent of leader. The GRE model means the disaster management partners, including government, resident and enterprises. Through the division of functions in different stage of disaster management, reduce disaster risk and improve resilience in community.

There are two ways of elevate enterprises to participate in disaster of prevention and relief: Tax-Saving and Corporate Image. We are promoting businesses and community involvement in program in three ways: information platform, public hearing and indirect involvement. Information platform primarily as a conduit of information and communication between enterprises and communities; public hearing goals to promote the concept and expansion Invitation equinated is the way to use more choose to assist community.

33 TITLE: Damage to the water system in the earthquakes of Maule 2010, Tohoku 2011 and Kumamoto 2016

Author: Yolanda Alberto*

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KEY WORDS: liquefaction, seismic behavior, pipelines, water distribution system

ABSTRACT: Repair of the damaged water system after a natural disaster is one of the major issues to solve in order to get back to normal conditions. The water system is intrinsically correlated to other important networks such as the energy, health and industry. Therefore, once the water distribution system is damaged, it makes it difficult for other sectors to recover quickly and get back to the pre-earthquake state. This paper describes the impact of the earthquakes in Chile 2010, and Japan 2011-2016 on their respective water systems. A summary of the damages is provided and classified as caused by ground motion and by ground failure. The response rates and times are provided for the affected cities. The effectiveness of different materials and previous implemented countermeasures is evaluated by the observed performances of the elements. Important observations to understand the factors causing water system outages, strategies used and their effectiveness to restore the service, as well as geotechnical and structural countermeasures, are provided, along with a comparison of the three cases. Finally, the importance of data collection and damage mapping to improve the system for future natural disasters, is highlighted with examples of damage distribution in the affected areas.

34 TITLE: Can Climate Change Causes Earthquakes ?

Author: Suryanshu Choudhary*; Ashok Gwal ; Jyoti Jalori

*Address: AISECT University, India

KEY WORDS: climate; seismic; triggering

ABSTRACT: A link between man-made climate change and increased seismic events has got some stick. The climate has changed naturally, and makes a convincing case for a historical relationship between natural climate change and some geological activity. When the climate changed naturally in the past, and the planet emerged from an ice age, large ice sheets covering much of the planet retreated. They were so heavy that the resulting release of

pressure on the earth's crust caused it to 'bounce back', triggering earthquakes, tremors, and even volcanic activity along pre-existing fault lines. Anthropogenic climate change has the potential to alter the risk of geological and geomorphological hazards. Such changes in risk have not yet been systematically assessed." Present paper shows the consequences of climate change on earth system science and also reflect the present scenario for such type of research in India.

35 TITLE: Enhancing Community Resilience to Climate Change-Related Disasters through Risk Communication: The Case of Amulung, Cagayan

Author: Ellaisa Ruth. Veluz; Aldo Gavril. Lim*

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KEY WORDS: Amulung, Cagayan, community resilience, disaster, indigenous technology, risk, risk communication

ABSTRACT: Guided by the Risk Communication Processes Model (Leiss & Krewski, 1989) and the Risk Management Cycle Model (Lang et al., 2001), the study set out to describe how risk communication between the expert sphere (industries and independent researchers) and the public sphere (media, general public, and public interest groups), as facilitated by the local government unit (LGU), has enhanced community resilience to climate change-related disasters in Amulung, Cagayan. The study specifically aimed to describe: 1) how hazards are identified in the municipality; 2) how risks are assessed in the municipality; 3) how risk-related policies are developed in the municipality; 4) how risk-related policies are implemented in the municipality; 5) how risk-related policies are evaluated in the municipality; and 6) the manifestations of community resilience in the municipality, particularly in Brgy. Bauan and Brgy. Palacu.

36 TITLE: The study examines human capacity building and sustainable development in the 21st century, implications and challenges.

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KEY WORDS: Human Capacity Building, Sustainable Development Stakeholders Policy, Design Implementation Strategy

ABSTRACT: Human capacity building is the bed-rock of any nation; no nation could strive to sustainable development without reference to the structures and policies that enhance its human capital. For example, Nigeria as a nation has established several programs geared towards improving human capacity building, such programs includes NAPEP, NDE etc. These programs have not yielded the desired result because of inadequate policy platform that guarantee sustainability among the stakeholders. The study has provided measures towards ameliorating these inadequacies and urges the relevant stakeholders to consider the recommendations for policy design and implementation strategy in achieving human capacity building and sustainable development in the 21st century.

37 TITLE: Landslides Forecasting Based on the Hydrological Process Simulation by the Program PCSiWaPro® in an Earth Dam

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KEY WORDS: landslides, hydrological modelling, forecasting

ABSTRACT: An earth dam is one kind of hydraulic construction, which is built with highly compacted earth and can be used for the purpose of containing water in a reservoir to secure the water supply, and in flood control (Bassell, 1904). An earth dam can be a safety issue, as it can experience catastrophic destruction due to the slope failure caused by various factors, such as seepage flow, atmospheric conditions (especially precipitation), vegetation, and so on.

The precipitation has direct influence on the water content change with the infiltration water into the unsaturated slope and then changes seepage line movement regime (especially in an extreme rainfall event). The significant influence of vegetation on slope stability can essentially be attributed to two major aspects: water movement via the soil–plant–atmosphere continuum (SPAC) (Coppin, et al., 1990) and soil reinforcement by the root system (Gray, 1995). Vegetation is a major component of SPAC, responsible for the suction force of water against gravity. By absorbing parts of the soil water, plants thus play a significant role in the drying of slopes (Huang and Nobel, 1994). This absorbed soil water will subsequently be removed through the transpiration process into the atmosphere. Ultimately, this water cycle system would result in less saturated and more stable slopes. Concurrently, vegetation also contributes to mass stability by increasing the soil shear strength through root reinforcement (Gray, 1995). The frequency of slope failures tends to increase when vegetation is cut down and their roots decay (Abe, 1997).

The aim of this study is to investigate the influence of the saturation degree on the slope stability of an earth dam under the consideration of precipitation and vegetation with the program PCSiWaPro®.

38 TITLE: The Correction Model of MODIS PWV of Hebei Province, China based on GNSS

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KEY WORDS: Precipitable Water Vapor, MODIS, GNSS, Hebei, Correction Model

ABSTRACT: High accuracy of precipitable water vapor (PWV) is helpful to the prediction of heavy precipitation weather forecast. For high resolution and low accuracy of MODIS PWV, it is necessary to model MODIS PWV. Taking 11 cities of Hebei Province as examples, the correction models of MODIS PWV based GNSS were studied. Firstly, it was compared between GNSS PWV and MODIS PWV. There was good correlation and existing system deviation between GNSS PWV and MODIS PWV, while the correlation coefficient was more than 0.879 and the root mean square error was amounted to 2.31mm. Secondly, it was constructed the citys' and regional MODIS PWV correction models using linear regression method. Finally, it was verified the reliability of city model and regional model compared

with GNSS PWV. It was concluded that city model and regional model of MODIS PWV can be effectively improved the accuracy of MODIS PWV while the root mean square error was small than 1mm. The accuracy of MODIS PWV correction model can be meeting the application of weather forecast.

39 TITLE: DAMAGE DETECTION IN A THREE-DIMENSIONAL TOWER MODEL USING MODAL CORRELATION COEFFICIENT ALGORITHM

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KEY WORDS: Damage Detection, Structural health monitoring, Modal Analysis

ABSTRACT: One of the key components of structural health monitoring is damage detection. This can be accomplished by visual inspection but as in the usual case, it is impractical to inspect each member of a complex structure, and hence as an alternative, another method must be employed – damage detection through modal analysis. A formula originally proposed analytically by M.M. Samman called Modal Correlation Coefficient (MCC) is a type of the latter method, and it is based on the changes in mode shape between the damaged and the undamaged structure, with emphasis on the abrupt deviations in the slope of the mode shape. For this study, a two-meter-high truss tower was designed and fabricated, and correspondingly used to experimentally implement MCC. Three cases of damage were introduced through the replacement of members having a different Elastic Modulus. The structure's undamaged and damaged modal properties were experimentally obtained using Operational Modal Analysis implemented with a PCB Model 393B04 High Sensitivity Uniaxial Accelerometer equipped in a LABView™ program. Post-processing of the obtained time domain accelerations was then accomplished in a MATLAB™ program to extract the modal properties. These properties were then verified through a theoretical approach using Finite Element Method in SAP2000™. The two sets of modal properties were consequently used in the MCC algorithm, with the assumptions that the damage is not extensive in that the symmetry of the mode shapes could no longer be assumed. The obtained results were able to validate the assumption, and show that MCC was able to detect the damage in all three cases examined.

40 TITLE: Political leadership and disaster management in the Philippines: the experiences of two municipalities

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KEY WORDS: disaster management, political leadership, local politics, Palo, Tanauan, Leyte, Haiyan, Yolanda, Philippines

ABSTRACT: The paper looks at the role of local political leadership in disaster management during the preparation, response, and rehabilitation efforts after the devastation brought by Typhoon Haiyan (Yolanda). The focus of this paper is the leadership, and effectively on accountability, of local officials in their response in the wake of the natural calamity. Two cases are studied: the municipalities of Tanauan and Palo, both are in the province of Leyte.

These cases provide two different characterizations of local chief executives and their involvement in disaster risk reduction and management. Also, taken into consideration are the national-local relations and the politics in between. The paper intends to draw lessons from the Philippines experience, which can serve as a guide for other similarly situated countries.

41 TITLE: Along strike variations in the electrical structure of the Gaoligong shear zone in west Yunnan, SW China: insights from 3D magnetotelluric imaging

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KEY WORDS: Gaoligong shear zone, western Yunnan, conductivity structure, Magnetotelluric, 3D inversion

ABSTRACT: The Gaoligong shear zone (GLGSZ) is located in the southeastern margin of the Tibetan plateau, and acts as tectonic boundary of Tengchong and Baoshan blocks in western Yunnan. Subsurface of the Gaoligong shear zone is an important constraint to the current competitive geodynamic models, such as rigid-block extrusion, continuum deformation and crustal flow, proposed to explain the tectonic deformation of southeastern Tibetan plateau. This paper presents a three-dimensional (3D) resistivity model inverted from recently deployed magnetotelluric (MT) array, reveals two types of crustal electrical structure of the Gaoligong shear zone along strike, namely the electrical 'Sandwich' crust and whole resistive crust beneath the shear zone. Instead of conspicuous conductive channel flow proposed in prior two-dimensional (2D) MT study in this area, distinct striped-shape conductive anomalies are identified in the mid-to-lower crust. The quasi-linear conductive anomalies are separated by resistive bodies that extends into the lower crust, and hence not consistent with the model of southeast crustal channel flow.

42 TITLE: Understanding Water Systems Resilience Problems in Tanzania

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KEY WORDS: Water Systems, Resilience, Disasters, Tanzania

ABSTRACT: The world's biggest devastation is currently due to disasters; their consequences range from deaths and physical damages of infrastructures to environmental, ecological and economic losses. Water systems are critical infrastructures and are recurrently affected by the impacts of disasters. In Tanzania, these events play a part in infrastructures failures; the country has experienced 266 different disasters contributing to 13,288 deaths, 57,556 injuries, and damages valued at 465.79 million USD for the period from 1900 to 2016. Water systems, in particular, are a subject of exposure to disasters, their resilience has been tested and has shown different responses. Of concern is the El Nino episodes of 1992-1993 and 1997-1998 which had significant impacts nationwide regarding economic losses, power blackout and rationing, widespread water-related diseases, infrastructure destructions and others. As such, different studies have investigated water-related issues, but little is known

about their resilience to disasters. This paper examines the problems and improvement measures of water systems resilience at a global scale and the case of Tanzania. The findings show that aging infrastructures, systems interdependency, unbalanced investment, limited community involvement, rapid population growth and urbanization, regular changes of the water ministry and others affect the resilience of water systems. On the other hand, acceleration of assets replacement, preparedness, installation of alternative power supply, community involvement, policies and plans enforcement, and balanced investment and others would improve their resilience. However, further studies are required to measure the resilience across all dimensions systematically.

43 TITLE: Research on emergency oriented mobile positioning data storage

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KEY WORDS: Trajectory data, Storage, Index

ABSTRACT: With the technical advances in location-acquisition, such as GPS embedded devices, the trajectory data can be easily obtained. During the event of earthquakes, floods, fires and other disasters, it's important to manage the trajectory data of mobile objects(rescue vehicles, rescue teams, the rescued persons etc) which are related to emergency rescue. However, during the emergency, the number of mobile targets is very large, the location changes frequently, the traditional database technology is difficult to manage the trajectory data effectively.

To utilize the large scale trajectory data in an efficient way, we design a distributed trajectory data storage management system. In our research, we extends the current distributed file system to make the data storage highly flexible and scalable. A NoSQL based distributed multidimensional spatio-temporal data storage mode is designed to support high fault-tolerant management and query. Considering the requirements of high concurrent retrieval and data updating, the paper studies the temporal and spatial distribution of moving targets in emergency situations and put forward the efficient spatial and temporal data indexes suitable for distributed computing environment.

Based on the study described above, a trajectory data prototype management system is implemented. By experimenting on the prototype system, the results show that the proposed trajectory data storage scheme is feasible and efficient in emergency. By using multiple evaluation indicators of the index, the experiment result also shows that the comprehensive performance of the index is superior to other methods.

44 TITLE: Can Climate Change Causes Earthquakes ?

Author: Suryanshu. Choudhary*; Ashok. Gwal; Jyoti. Jalori

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KEY WORDS: climate, seismic, triggering

ABSTRACT: A link between man-made climate change and increased seismic events has got some stick. The climate has changed naturally, and makes a convincing case for a

historical relationship between natural climate change and some geological activity. When the climate changed naturally in the past, and the planet emerged from an ice age, large ice sheets covering much of the planet retreated. They were so heavy that the resulting release of pressure on the earth's crust caused it to 'bounce back', triggering earthquakes, tremors, and even volcanic activity along pre-existing fault lines. Anthropogenic climate change has the potential to alter the risk of geological and geomorphological hazards. Such changes in risk have not yet been systematically assessed." Present paper shows the consequences of climate change on earth system science and also reflect the present scenario for such type of research in the World.

45 TITLE: From Source to Building Fragility: Case study of the 2013 M7.1 Bohol Philippines Earthquake

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KEY WORDS: earthquake, building fragility, seismic hazard, Philippines

ABSTRACT: We use ground motion simulations of the 2013 Bohol Philippines earthquake along with a new post-disaster exposure/damage database to constrain building fragility and vulnerability. The large number of damaged buildings (>70,000) and the wide spread of seismic intensities caused by this earthquake make it an ideal candidate for such a study. An extensive survey was conducted leading to a robust description of over 25,000 damaged and undamaged structures. Ground motion fields were simulated using ground motion prediction equations and stochastic modeling, and the estimated and observed values were compared. The finite source model used in the simulation was based on the analysis of aftershocks and SAR data. The ground motions were associated with the empirical database to derive fragility and vulnerability models. Results indicate that the pattern of damage is best captured in the stochastic simulation. Constraints were placed on seismic building fragility and vulnerability models, which can promote more effective implementation of construction regulations and practices.

46 TITLE: Dynamic Display of Population Thermodynamic Chart based on Mobile Terminals for Earthquake Emergency

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KEY WORDS: Earthquake emergency, Mass data, HDFS, HBase, Spark, Redis

ABSTRACT: Population distribution and emergency shelter capacity of earthquake region is as direct evidences for emergency, rescue and disaster reduction when an earthquake occurs. Location-Based Services (LBS) play an important role in earthquake emergency. But technique of LBS services is often subject to coverage of wireless network and open of terminal function. If base stations are damaged by earthquake, or GPS functions are not opened by users, or mobile phones turned off, all these circumstances looked to incorrect location of population distribution. On the other hand, for conventional database system,

mass data don't update in time, which also could face delays to earthquake emergency. So, this paper presents a new method on dynamic display of population thermodynamic chart based on mobile terminals for earthquake emergency. By this method, even if there is no wireless network and open of terminal function, we can accurately obtain and display location of population distribution.

47 TITLE: Disaster vulnerabilities and cultural resiliencies: Developing and transmitting the Sugidanon (Epics of Panay, Central Philippines) amidst Climate Change

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KEY WORDS: Indigenous Disaster Risk Reduction Management, Cultural Resiliency, Multiple Vulnerabilities

ABSTRACT: Starting from a preliminary field visit in the heartland of Jocano's Sulod Society (1968) and Magos' Panay Bukidnon communities (1993) in Central Philippines to document the cultural effects and damages brought about by Typhoon Haiyan (Yolanda); this paper re-conceptualizes the continuity, transmission and protection of the rich Panay epic chanting called the Sugidanon amidst increasing vulnerabilities and challenges brought about by disasters and climate change.

Building on the wealth of participant observation notes, qualitative interviews and a National IKSP-CLRD research permit, this paper argues that outside of parochial and funding concerns, the institutionalization and stability of Schools of Living Tradition are indispensable mediums for the protection and continuity of the Sugidanon and material culture of Panay Bukidnons in recognition of the increasing disaster vulnerabilities as shown by Haiyan.

The paper challenges scholars and community workers to consider Indigenous Disaster Risk Reduction Management and Resiliency frameworks at the heart of building new scholarship and linkages for the Sugidanon as the identities and culture of Tumandoks in Central Panay has advanced from the traditional cultural anthropological and ethnomusicology concerns into a matter of personal and cultural survival brought about by disasters.

48 TITLE: Coping Strategies to Natural Disasters

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KEY WORDS: disaster, risk management, local governance

ABSTRACT: We explore the local government's responses to natural disasters in the Philippines and determine the optimal policy mix of ex-ante and ex-post risk management strategies. While it is widely accepted that the impact of natural disasters is inherently local, there is too little focus on the local responses to natural disasters. Effective local response is flexible and varied, even as it exists within a national or regional framework of disaster risk management. This is especially true in the Philippines, an archipelago with 7,641 islands. Studies of disaster impact in the economic literature are often pigeonholed into either

analyzing macroeconomic impacts or investigating one or two cities affected by a particular disaster. Both have their place, but each one is limited in terms of providing support for actionable policy. Macroeconomic analysis smoothens away the effects of each disaster event. This makes it difficult to formulate specific policies. On the other hand, case studies can inspire effective policies in the specific areas, but not in others. Therefore, they are often insufficient in terms of providing a more general framework.

To account for this, we use data from a novel survey on disaster risk management. Local government units were surveyed on their coping strategies to disasters, covering a sample of cities and municipalities in 37 provinces throughout the Philippines. We limit our study to high-frequency disasters like typhoons, floods, and tsunamis.

49 TITLE: Study on the Influences of Emergency Rescue in Multi-hazard Scenario—A Case Study of Earthquake and Snowstorm in Xinjiang

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KEY WORDS: Multi-hazard; emergency rescue; coupling effects

ABSTRACT: The multi-hazard scenario is a common phenomenon in emergency rescue. The impact of multi-hazard on emergency rescue is the key problem in emergency management research. Different from the single disaster scenarios, the evolution of multi-hazard scenario is more unknown, have more complex coupling effects, and its emergency management is more difficult to control and implement. In this paper, the common natural disaster— earthquake and snowstorm in Xinjiang are taken as examples. Analyzing from characteristics of three aspects: hazard body, bearing body and anti-hazard body, this paper concludes the new impacts of emergency rescue in multi-hazard scenario; mines possible transformation relationships of these three dimensions, raising some relating suggestions towards the resulting emergency rescue influences, so that emergency rescue managers can quickly focus in the multi-hazard scenario.

50 TITLE: Human insecurity, forced migration and disaster recovery

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KEY WORDS: Human insecurity, Population Displacement, Disaster recovery

ABSTRACT: This study delves into the nexus of human security, "forced" migration and recovery from disaster. Specifically, it describes the human insecurity dimensions as experienced by individuals in the community; demonstrates how it impinges on migration; and explains why it impedes recovery.

Data were generated from two consecutive surveys in 2015 and 2016, using a multi-stage stratified sampling design in 20 selected communities in Tacloban, Palo and Tanauan that were most affected by Typhoon Yolanda.

The study found that a large proportion of those who returned from emergency shelters are still waiting to be placed in a permanent relocation area, however almost half of them also said that they intend to stay permanently in their current community, notwithstanding access

to social services and livelihood in their community has not significantly improved, three years after the disaster. Both surveys also reveal that majority of the males are employed while their female counterparts are unemployed. Although most of them are employed, income is very low and unstable and many of them are doing menial jobs such as pedicab driving, vending and tending a small “sari-sari” (variety) store.

Environmental human security is not the only concern of people affected by the Yolanda disaster, stable income and sustainable livelihood as well as security of land tenure, are also major concerns that also impact on personal and community human security. As gleaned from the data, it is important to strengthen coping capacities of communities by protecting their livelihood and ensure that their basic health, nutrition and education needs are met, in order to hasten recovery in the event of a natural threat.

51 TITLE: Private enterprises in the Government's disaster prevention education promotion - case study of medical institutions

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KEY WORDS: Medical institution, Disaster management, Disaster prevention community.

ABSTRACT: Medical institutions is the last medical places in disaster. In addition to medical personnel, most of the patients are vulnerable groups in disaster, that's why disaster management is the most important lessons for medical institutions which need strengthen the knowledge and skills by self. Typhoons, floods and tsunamis and other natural disasters caused by climate change are not incidental event, that happening be frequent and for a long time. Residents should have awareness of disaster prevention because this type of natural disasters belong complex disaster which no specificity.

Government's resources are limited to promote disaster prevention knowledge to long period, that will be able to make disaster prevention more efficient if it used the private resources properly. Through medical institution to share their disaster management experience would help residents to set up their principle of disaster prevention and evacuation in community. Medical institution. Medical institutions compile disaster prevention materials (CPR/AED, health promotion...) from communities disaster case history to promote disaster prevention community.

52 TITLE: Spatial and Temporal Distribution of Main Flight Exceedance Events Based on FOQA Data

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KEY WORDS: Exceedance event, Spatial-temporal Distribution, Geographic Environment Factors, Flight Operational Quality Assurance

ABSTRACT: Analysis of flight exceedance events extracted from the Flight Operational Quality Assurance (FOQA) data is important for flight safety study and management. This

paper researches the flight exceedance events from the perspective of geography. Exceedance events happens mostly within tens of kilometers around the airport. This surrounding geographic environment of the airport was called Airport Area in our paper. The spatial distribution of the main flight exceedance events was obtained based on Airport Area and their spatial autocorrelation was analyzed. Diurnal variation and monthly changes of the frequency of flight exceedance was also analyzed. The impact of geographic environment on exceedance was examined by ordinary least squares regression analysis of the frequency of exceedance events and several geographic environment factors. The spatial distribution of Speed High Rotation and High Load Factor during Flight was found autocorrelated, and Speed High Rotation was influenced by altitude and temperature and wind while High Load Factor during Flight is influenced by altitude and relief amplitude.

53 TITLE: Enhanced Surface albedo since 1987 and influence on local climate in southwest Kunming and Dali City, Yunnan

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KEY WORDS: albedo, climate change, drought, human activities, Landsat5 TM images, FLAASH

ABSTRACT: The climate change in Southwest China is obvious since the 21st century, especially in Yunnan Province where severe drought happened in 2009. To understand the causes of the climate change, we retrieved surface albedo by FLAASH (Fast Line-of-sight Atmospheric Analysis of Spectral Hypercubes) based on Landsat5 TM images of part of Yunnan Province between 1987 and 2011. The results showed that, in southwest Kunming, the average surface albedo of Band1 (0.45~0.52 μm) and Band2 (0.52~0.60 μm) enhanced obviously while that of Band5 (1.55~1.75 μm) and Band7 (2.08~2.35 μm) weakened gradually in the 1990s. However, the average surface albedo of Band3 (0.63~0.69 μm) and Band4 (0.76~0.90 μm) fluctuated on a small scale, not showing any variation trends. Taking ground objects variation and their spectrums into consideration, we believe that it's the reformation to the earth's surface because of human activities that caused the rise of average surface albedo of Band1 and Band2, while the decline of that of Band5 and Band7 suggested the improvement of vegetation coverage. We estimate the increment of the energy the atmosphere absorbed in southwest Kunming between February and April at 0.44~1.56 $\text{w} \cdot \text{m}^{-2}$, at least. Therefore, we believe human activities was responsible for more energy's entry into atmosphere in the ways of changing surface albedo and thermodynamic properties of underlying surface, causing climate warming, which would influence atmospheric circulation. Finally, we concluded that this time of climate change is closely related to human activities.

54 TITLE: Disaster Assessment of Development in Rural Travel of Bedrock Channel in ChangZhou Village, Jixian, Tianjing

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KEY WORDS: bedrock channel, rural tourism, collapse, landslide, debris flow

ABSTRACT: The depositional gradient is inclined to be formed by the most steady state of energy. However, exploitation tends to break the balance. Over exploitation of residence constructions and rural travels in Chang Zhou village changed the natural state of ravine. Therefore, there are a lot geologic hazards.

The base rock of entrance to a village is quartz sandstone, which is relatively hard according to the Mohs scale. Due to steep slope and huge rocks originated at the entrance to the village, we can learn that the collapse happened before. Thus, the villagers didn't build the houses there in the past time. However, they start to do some now. The base rock of the upstream area is gneiss, soft and easy to be weathered. If it rains in the mountain, the debris flow will be likely to happen. In the most prosperous area, many people excavated slopes to build villas filled with stones and cement. However, the strength of the cement will decrease as time goes by. Therefore, if it rains, it will easily cause the landslide. Going along the highway, we found the stream channel has become narrow or has been led into the ground under construction. If there is heavy rain, it will result in flooding along with sands and gravel. The villas will be severely destroyed.

According to the aforementioned, the trace of landslide, collapse, and debris flow, and description of previous disasters, we can tell that Chang Zhou village is an area liable to geological disasters. Recently, the constructions have gone beyond environmental carrying capacity. Once earthquakes or heavy rain hit, there will be dire consequences. Thus, it will lead to heavy casualties, not to mention in high season. Nowadays, a lot of rural constructions in China are faced with the same situation. We should keep fully alert.

55 TITLE: Researches on Emergency UAV Intelligence Reconnaissance and Communication Relay Command System

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KEY WORDS: UAV; emergency rescue; intelligence reconnaissance; communication relay

ABSTRACT: People's Armed Police (PAP) is an important national armed forces. It's responsible for the implementation of the task of disaster relief mission. At the present stage, there are mainly three means of reconnaissance for PAP: ground reconnaissance, human airborne reconnaissance and satellite remote sensing. But the traditional reconnaissance means exist high risk factor, high flight cost, real-time synchronization data difficulties and so on. Unmanned aerial vehicle (UAV) system with high mobility, low cost, easy maintenance and other characteristics can avoid the influence of environmental factors at a certain height. UAV system equipped with real time high-precision images transmission equipment and visible, infrared camera can quickly get the map of the disaster area. Then it can realize the rapid and real-time monitoring of disaster site. Also the system can improve

the emergency situation of multi-dimensional disaster environment perception and real-time information transmission capacity. The use of UAV system equipped with wireless communication relay equipment, can avoid the use of human power relay difficulty and risk. Researches show that the emergency UAV system has a unique advantage in the field of environmental monitoring, communication relay, post-disaster assessment and so on.

56 TITLE: Prospective Application of Unmanned Aerial Vehicle Technology to Emergency Rescue in Disaster

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KEY WORDS: unmanned aerial vehicle, emergency rescue, disaster, application

ABSTRACT: In recent years, disasters have been happened frequently all over the world. Disasters always take place suddenly, quick response is very important for rescue. The key factor to improve emergency rescue in disaster is to obtain the disaster information quickly and accurately, and then make efficient and feasible rescue plan. Unmanned aerial vehicle (UAV) with a real-time, fast maneuvering, economic and convenient features, and can operate in the complex environment of disaster, which suitable for all kinds of disaster emergency rescue. With the rapid development of UAV, UAV technology is maturing. UAV technology has a clear advantage in the prevention and response to disasters, and it plays important role for improving rescue efficiency and quality. In this paper, composition of UAV system, current situation and trend of UAV technology were introduced first. Then its application in the course of disasters rescuing was discussed, and the application of site investigation, early warning and monitoring, delivery of persons and goods, site indemnification and so on were introduced in detail. In the end, the application prospect of UAV technology in disaster emergency rescue was forecasted, in order to provide reference for the development of follow-up UAV rescue.

57 TITLE: 武警部队应对 2022 年冬奥会的主要任务及其策略

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KEY WORDS: 2022 冬奥会, 雪崩, 应急救援

ABSTRACT: 2022 年北京冬奥会申办成功给武警部队的应急救援提供了新的机遇与挑战。除常规的警戒任务外, 武警部队还将承担排险、封闭赛道、遇险人员的搜救与处理等任务。这些任务具有时效性、专业性、科学性和复杂性的特点, 为了更好地完成遂行任务, 必须对执行任务的官兵必须进行有效的培训, 培训内容除雪崩基本知识的传授外, 还需要进行相关的爆破排险、人员搜救技能方面的训练, 在此基础上, 实地的野外演练也必不可少。

58 TITLE: Spatial pattern of rocky desertification in southwest China and its driving forces

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KEY WORDS: rocky desertification, spatial pattern, southwest China, driving forces

ABSTRACT: Rocky desertification is a special kind of land degradation, characterized by soil erosion and bedrock exposure. The related inverse terrestrial process may cause serious declines in land productivity, flash floods, landslides and debris flows, all with high natural disaster risks. In a broader sense, rocky desertification and the losses of water and soil may form a vicious circle, which may seriously restrict the ecological and economic developments of the local areas. As we all know, rocky desertification is prone to occur in the karst environments. Karst terrain consists of mountainous limestone with barren soil, severe water-soil erosion, frequent flood and drought disasters, and fragile ecosystems, and the issues caused by rocky desertification in the karst areas tend to be much more serious than in other terrains. The southwest China is the largest karst region in the world. Due to poor ecological environment and high population density, rocky desertification is particularly serious across this region. More comprehensive strategies for controlling and solving of the rocky desertification have become the focus of the Chinese government and society. To achieve this goal, it is required to fundamentally explore its distribution and causes, e.g., by identifying the key factors influencing its processes. Different from the previous studies on the evaluation of rocky desertification at fine scales, this study attempted to innovatively reveal the relationships between rocky desertification and its driving forces at large scales. Specifically for the first aspect, the spatial pattern of rocky desertification across the 770 counties of the eight provinces in the southwest China in 2008 was analyzed and mapped. For the second aspect, the influence factors were classified into two groups, given that the fragile ecological and geological environments are the formative foundation of rocky desertification and human disturbances are the driving forces of its deterioration. Correspondingly, climate factors, such as annual mean temperature and annual total precipitation, and socioeconomic factors, such as gross domestic productivity (GDP) and population density, were considered in the investigation of the influence factors by using the redundancy analysis method. Test showed that the rocky desertification was positively related with the increase in temperature and precipitation, and the climate change accelerated rocky desertification in the southwest China. Overall, the inferences facilitate better understanding of the macro-characteristics of rocky desertification, and further, assuming appropriate plans to deal with the increasingly serious issue of rocky desertification.

59 **TITLE: A Prediction Scheme of Tropical Cyclone Frequency Based on Lasso and Random Forest**

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KEY WORDS: Tropical Cyclone, year-to-year increment, Lasso, Random Forest, Prediction

ABSTRACT: This study aims to propose a novel prediction scheme of tropical cyclone frequency (TCF) over the Western North Pacific (WNP). We concerned the large-scale meteorological factors inclusive of the sea surface temperature, sea level pressure, the Niño-3.4 index, the wind shear, the vorticity, the subtropical high and the sea ice cover, since the chronic change of these factors in the context of climate change would cause a gradual

variation of the annual TCF. Specifically, we focus on the correlation between the year-to-year increment of these factors and TCF. The Least Absolute Shrinkage and Selection Operator (Lasso) method was used for variable selection and dimension reduction from eleven initial predictors. Then a prediction model based on Random Forest (RF) was established by using the training samples (1978-2011) for calibration and the testing samples (2012-2016) for validation. The RF model presents a major variation and trend of TCF in the period of calibration, and also fitted well with the observed TCF in the period of validation though there was some deviations. The leave-one-out cross validation of the model exhibited most of the predicted TCF are in consistence with the observed TCF with a high correlation coefficient. A comparison between results of the RF model and the Multiple Linear Regression (MLR) model suggested the RF is more practical and capable of giving reliable results of TCF prediction over the WNP.

60 TITLE: Scenario-based hazard analysis of extreme high temperatures experienced between 1959 and 2014 in Hulunbuir, China

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KEY WORDS: Extreme high temperature, Hazard, Hulunbuir, Detrended fluctuation analysis (DFA), Weibull

ABSTRACT: As a significant feature of global climate change, extreme high temperatures are more frequent and intense in recent years and are the subject of recent study as it poses a threat to humanity and property in pastoral. Understanding the hazard posed by extreme high temperature is a key issue to select intervention measures targeted reducing its socio-economic and environmental damages and losses. In this research, detrend fluctuation analysis (DFA) was used to identify extreme high temperature events, on the basis of homogenized daily minimum and maximum temperature from nine meteorological stations in the world's best grassland, Hulunbuir, over the past 56 years. Through the comparison of widely used functions that deal with the extreme value problem, Weibull was selected to simulate extreme high temperature scenarios with four return periods of 10, 30, 50, and 100 years. The scenario distributions were then expanded in detail. We found that trends of extreme high temperature and probability of its indices showed a significant increase, with some regional differences. The hazard of extreme high temperatures in four return periods exhibited extremely low hazard in the center region and increased from center to periphery. With the increasing length of return periods, the area of high hazard and extreme high hazard increased from 41929.96 km² to 53155.37 km² and 36536.17 km² to 40541.92 km², respectively. Topography and anomalous circulation patterns may be the main factors resulting in the occurrence of extreme high temperatures in this study. The study also identified that warm days, warm nights, dry sandy ground warmed by the preceding hot days and smaller lake or drainage distributions were the other impact factors.

61 TITLE: A new seismic disaster risk assessment model considering earthquake business insurance

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KEY WORDS: Seismic hazard assessment, insurance model, vulnerability analysis, GIS, Cloudy data

ABSTRACT: Earthquake makes a huge impact on the socio-economic and national security through the development of the human society. With the rapid progress of urbanization and the Chinese economy, the economic losses caused by earthquake have an increasing trend. As an effective means of sharing and compensating for earthquake loss, insurance gets the attention of the world and has been rapidly developed. Pricing is not just the core technology in the design of the earthquake insurance products, but also a worldwide problem. An earthquake insurance Classification ratemaking model combined with seismic hazard analysis, structural vulnerability analysis, insurance-scale analysis and financial risk analysis is proposed in this paper by using classification ratemaking method. the model is divided into four modules of seismic hazard, structural vulnerability, insurance-scale and financial based on analysis of the rate structure and factors. this model partitions earthquake insurance rates by dividing the insurance zones and classifies earthquake insurance rates by structural vulnerability analysis. Combining with GIS technology and cloud computing, this paper discusses the construction of earthquake insurance pricing system and puts forward a reasonable architecture of earthquake insurance pricing system based on earthquake insurance classification ratemaking .

62 TITLE: Modeling the Traffic Disruption Caused by Pluvial Flash Flood on Intra-urban Road Network

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KEY WORDS: Pluvial flash flood (PFF), integrate flood and traffic, dynamic interplay, traffic disruption, intra-urban area

ABSTRACT: Pluvial flash flood (PFF) can cause serious traffic disruption in big cities. We conducted an interdisciplinary research by integrating flood modeling and traffic analysis to reveal the spatiotemporal pattern of the interplay between these two processes. A simplified simulation tool, which is capable of building the road network model, assigning trip paths with the effect of road closures, and evaluating travel delay (TD) and vehicle volumes (VV) redistribution in a given PFF scenario, was developed to capture the traffic disruption in the face of PFF events. Modeling outputs from a case study in the city center of Shanghai showed that the TD of vehicles diverted to dry links or trapped in flooded links may reach 2-10 times of the travel time in no flood scenarios. Overall, approximately 15%-25% of VV on flooded links would be redistributed onto dry links (more likely major arterial roads). But the VV variation during each time interval demonstrated evident disparity with the spatiotemporal change of flood inundations. Simulating and mapping the congestion can largely facilitate the identification of vulnerable links. Future research will test the method in other intra-urban areas and try to bridge the gap between modeling outputs and smart city

planning and management.

63 TITLE: A new method using multi-temporal Sentinel-1 data for building damage assessment on example 2016 Italy earthquake

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KEY WORDS: Sentinel-1, GLCM, Earthquake, disaster, building, damage, assessment

ABSTRACT: At the present time, there are no scientific works about building damage assessment using Sentinel-1. Because many scientists ignore its, due to middle resolution, general trend is the use of high resolution SAR data (TerraSAR-X, COSMO-SkyMed and etc.) for that purpose. It is to be related to the problem that a middle resolution SAR data has lower overall accuracy than high resolution. Unlike high resolution Sentinel-1 data is free available, pre-event data is always available for change detection method. In this paper, middle resolution Sentinel-1 data is used first time for building damage assessment. Change detection and texture based method are used together to increase overall accuracy. Homogeneity and Dissimilarity GLCM texture parameters found as better for separation of a collapsed and intact buildings. Dual polarization (VV,VH) backscattering coefficients and coherence coefficients (before earthquake and coseismic) were fully utilized for this study. There were defined the better multi variable for supervised classification of none building, damaged and intact buildings features in urban areas. In this work, we were achieved overall accuracy 0.77, producer's accuracy for none building is 0.84, for damaged building case 0.85, for intact building 0.64. Beijing-2 high resolution optical data and Copernicus Emergency Management Service data were exploited for that classification. Amatrice town was chosen as most damaged from 2016 Central Italy Earthquake.

64 TITLE: Effects of sea level rise, land subsidence, bathymetric change and typhoon tracks on storm flooding in the coastal areas of Shanghai

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KEY WORDS: Storm Flooding, Sea Level Rise, Land Subsidence, Bathymetric Change, Relative Contribution

ABSTRACT: We compared the effects of sea level rise (SLR), land subsidence (LS) and bathymetric change (BC) on storm flooding in the coastal areas of Shanghai. The hydrological simulation model MIKE 21 was used to simulate flooding under multiple scenarios projected to year 2030 and 2050. Historical typhoons (TC9711, TC8114, TC0012, TC0205 and TC1109), which caused extremely high surges and considerable losses, were selected as reference tracks to generate the case typhoon events making landfalls in Shanghai (SHLD), in the north of Zhejiang (ZNL) and moving northwards in the offshore area of Shanghai (MNS). Results demonstrated both the individual and the combined effects of SLR, LS and BC on storm flooding within the next four decades. Generally, storm flooding is much more serious in compound effects by SLR, LS and BC. Among the three change factors,

bathymetry is the main factor responsible for more storm flooding in the short term scenarios (year 2030), especially in the SHLD track scenarios. Sea level rise and land subsidence will become the dominate factors in the long-term scenarios (year 2050), especially in the SHLD and MNS track scenarios.

65 TITLE: Stress development in heterogenetic lithosphere: Insights into earthquake processes in the Tan-Lu Fault Zone

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KEY WORDS: Tan-Lu Fault Zone, Active earthquake zone, Heterogeneous lithosphere, Viscoelastic model, Stress field

ABSTRACT: The continental-scale Tan-Lu Fault Zone (TLFZ) is a particularly dangerous active earthquake zone that generated the 1668 M8.5 Tancheng, the 1969 M7.4 Bohai and the 1975 M7.3 Haicheng earthquakes. Although this region has been investigated extensively, the seismological features of different segments of the TLFZ and the ultimate controls on earthquake initiation, particularly the roles of the widely spread soft low-velocity zone (heterogeneous lithosphere) along different segments of the TLFZ, remain unclear. In this study, we develop a viscoelastic finite element model for the TLFZ to conduct a series of numerical experiments with the goal of determining the impact of heterogeneity in the upper crust, the middle crust, the lower crust, and the mantle on earthquake nucleation and rupture processes. New 1-by-1 degree global crustal model (CRUST1.0) are utilized to infer the viscosity structure of the lithosphere which provide an important input to the numerical models. Results indicate that when differential stresses build in the TLFZ, the stresses accumulating in the middle crust of the Bohai-Xialiaohe segment, the Bohai-Bozhong segment and Yishu segment are highly concentrated, whereas the stresses in Jiashan-Guangji segment and other depth (except the middle crust) of the whole TLFZ are comparatively low. The numerical observations coincide with the observed distribution of seismicity throughout the region. By comparing the numerical results with the viscosity structure of the heterogeneous lithosphere, we argue that the extensive lower crust low velocity zone beneath the space distribution of the moderate-strong earthquakes produces differential stress localization in the layers above. Meanwhile, the “dumbbell-shaped” structure of the middle and lower crust in TLFZ triggering earthquakes in this region. Furthermore, the concentration of the moderate-strong earthquakes in the middle crust of Bohai-Bozhong segment rather than upper mantle reveals a lower lithospheric strength in upper mantle of Bohai-Bozhong segment, which may indicate a ductile layer of the uppermost portion of the upper mantle.

66 TITLE: Stress development and Earthquake Migration: Insights into Earthquake Processes in the Bo-Zhang Fault Zone

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KEY WORDS: Bo-Zhang Fault Zone, Earthquake Migration, Heterogeneous lithosphere,

Viscoelastic model, Stress field

ABSTRACT: The Bo-Zhang Fault Zone (BZFZ) is a dangerous active seismic zone that generated the great 1976 Tangshan earthquake and 1998 Zhangjiakou earthquake. The BZFZ is located in the middle and north part of the North China Plain, and in the main part of the Cenozoic rift zone. The fault zone is one of the strongest seismic zones in the eastern part of China's mainland. Although this region has been investigated extensively, the seismological features of different segments of the BZFZ and the ultimate controls on earthquake initiation, particularly the roles of the widely spread soft low-velocity zone (heterogeneous lithosphere) along different segments of the BZFZ, remain unclear. Based on the deep analysis of basin structure and its evolution characteristics, we study the relationship between basin structure, deep structure and its relationship from the three-dimensional structure and homogeneity of the seismic zone. In this study, we develop a viscoelastic finite element model for the BZFZ to conduct a series of numerical experiments with the goal of determining the impact of heterogeneity in the upper crust, the middle crust, the lower crust, and the mantle on earthquake nucleation and rupture processes. The numerical observations coincide with the observed distribution of seismicity throughout the region. It is recognized in the paper that the seismic activity in BZFZ is the result of the interaction between the velocity anomalies and the active structures. Results indicate that when differential stresses build in the BZFZ, the stresses concentrate in the earthquake-prone areas, such as the Tangshan seismic zone and the Peking Plain seismic zone. The simulation results are used to discuss the law of seismic migration in the fault zone and estimate the future seismic risk.

67 TITLE: Types of natural disasters and monitoring systems in the World Heritage Site of Hoh Xil, Tibet Plateau

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KEY WORDS: Hoh Xil, Natural disasters, Monitoring system, Protection

ABSTRACT: Hoh Xil in Qinghai enters World Heritage List as a natural site on 7th July, 2017. The nominated property boasts a vast area of the densest distribution of lake bodies on the world's largest, highest, and youngest Qinghai-Tibetan Plateau. It is a fragile alpine sensitive area most affected by climate change yet deprived of sufficient long-term monitoring data. An increasingly frequent occurrence of natural hazards brings threats to the management facilities and public security, such as snow disasters, earthquakes, frost heave, glacier recession, dam break, pikas disasters and grassland desertification. The major four types of natural disasters in Hoh Xil include meteorological, geological, hydrological and biological disasters, among which meteorological events account for more than 95% of natural disasters loss. To deal with possible natural disasters, we should strengthen the monitoring system and protection mechanism in the following three aspects: (1)Connect new weather monitoring facilities with the local weather forecast network for disastrous weather reporting. (2)Closely monitor the New Lake and upstream waters, prepare contingency plans for potential dyke failures, and use practical techniques to ensure the safety of the Qinghai-Tibet highway and supporting facilities. (3)Reinforce desertification and pikas monitoring and build an emergency protocol through using the data as references for

ecological improvement initiatives, including livestock capacity adjustment.

68 TITLE: Evaluation of natural disasters and monitoring systems in the World Heritage Site of Hoh Xil, Tibet Plateau

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KEY WORDS: Hoh Xil, Natural disasters, Monitoring system, Protection

ABSTRACT: Hoh Xil in Qinghai enters World Heritage List as a natural site on 7th July, 2017. The nominated property boasts a vast area of the densest distribution of lake bodies on the world's largest, highest, and youngest Qinghai-Tibetan Plateau. It is a fragile alpine sensitive area most affected by climate change yet deprived of sufficient long-term monitoring data. An increasingly frequent occurrence of natural hazards brings threats to the management facilities and public security, such as snow disasters, earthquakes, frost heave, glacier recession, dam break, pikas disasters and grassland desertification. The major four types of natural disasters in Hoh Xil include meteorological, geological, hydrological and biological disasters, among which meteorological events account for more than 95% of natural disasters loss. To deal with possible natural disasters, we should strengthen the monitoring system and protection mechanism in the following three aspects: (1) Connect new weather monitoring facilities with the local weather forecast network for disastrous weather reporting. (2) Closely monitor the New Lake and upstream waters, prepare contingency plans for potential dyke failures, and use practical techniques to ensure the safety of the Qinghai-Tibet highway and supporting facilities. (3) Reinforce desertification and pikas monitoring and build an emergency protocol through using the data as references for ecological improvement initiatives, including livestock capacity adjustment.

69 TITLE: Seismic Geodynamics of Longmenshan Faults

Author: Hou Guiting*; Fang Peng

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KEY WORDS: Longmenshan faults, Wenchuan earthquake, Seismic geodynamic, Viscoelasticity, Channel Flow, Segmentation, Heterogeneity

ABSTRACT: Longmenshan faults, located in the northwest of China, have generated the 2008 Wenchuan earthquake (Ms 8.0) without apparent precursors, which shocked the world. The fundamental driving force of the large earthquakes is the accumulation and release of energy resulted from the relative motion between Tibetan Plateau and Sichuan Basin. Currently, the geodynamic mechanisms of earthquakes in Longmenshan faults mainly divide into two views, respectively, Oblique Stepwise Rise and Channel Flow. The former focuses on the faults of the upper crust, while the latter emphasizes the different rheological structure of crust. To discuss the role of the two, this paper establishes two three dimensional viscoelastic models based on the heterogeneity of seismic wave velocity and the segmentation of the faults. Both models take crustal rheology into account, namely Channel Flow. But for segmentation, one simulating pre-earthquake (Wenchuan earthquake) situation sets up the southern section of Longmenshan faults opening and middle section locked, on

the contrary, the other one simulating post-earthquake situation sets up entire faults opening. Using ANSYS finite element software to simulate two models' evolution of stress and strain, the calculated results of both pre-earthquake and post-earthquake models prove there is highest stress in Longmenshan faults at the depth of Wenchuan earthquake focus (~18km) due to Channel Flow, and middle section of has higher stress than southern section because of heterogeneity. Nevertheless, the stress of middle section is released in the shallow and higher near the depth of focus after the earthquake, when the stress of southern section is similar in the two models. So we suggest that Channel Flow is the prerequisite of energy accumulation in Longmenshan faults, and the segmentation of the faults determine the distribution of earthquakes. Our simulation and research provide effective reference to explain seismic geodynamics of Longmenshan faults.

70 TITLE: Institutional Framework and Disaster Risk Governance – a case of 2015 Myanmar Floods

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KEY WORDS: Flood, Disaster Governance, Disaster Risk Reduction, Institutional Framework, Climate Change

ABSTRACT: Institutional framework and Risk Governance mechanism for natural disasters are playing a significant role to guide the administrative systems of the central and provincial governments. Risk management Policies and legislations are paramount important components towards defining the efficiency of the on-ground implementation of the plans. The study principally examines the efficacy of the disaster management policy and plans and its implications in Myanmar in the context of 2015 heavy rainfall and floods, which impacted a wide geographic area with a long term socio-economic consequences. The study will also highlight the role of recently formed democratic government in Myanmar and related challenges in the perspective of 2015 Monsoon flood disasters. A review of the published literature on the institutional mechanism for Myanmar, multi-hazard impacts and Emergency Humanitarian Response during 2015 disasters showing the concern in crisis management / emergency response and the associated issues of the Cognition, Communication, Coordination and Control. The paper analyzed the efficacy of the institutional structure and hierarchy of administrative structure at the federal, provincial and local levels for the disaster risk governance.

71 TITLE: InSAR Processing of Sentinel-1 TOPS Data and Its Application in Disaster Monitoring and Identification -- A Case Study of 6.24 Maoxian Landslide

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KEY WORDS: natural hazards, InSAR, Sentinel-1, TOPS, Maoxian landslide

ABSTRACT: On 24 June 2017, a landslide occurred in Maoxian county, Sichuan province,

China, burying 1600 meters of road, blocking a 2-kilometers section of a river and leaving 112 missing. Landslide is one of the major causes of life losses, injuries, and damages with an adverse impact on environment and human safety worldwide. It is crucial to identify and monitor this phenomenon for hazard mitigation and risk management.

Compared with other conventional methods such as field surveys and GNSS, InSAR techniques can offer great support to natural hazard detection and monitoring since they provide ground displacement data characterized by rapid and easily updatable measurements, millimetric and centimetric precision, high spatial resolution, good temporal sampling, and wide area coverage, consequently, reducing efforts and costs.

The Sentinel-1 mission, operated by the ESA, has been specifically designed for large-scale InSAR analyses. TOPS (Terrain Observation by Progressive Scans), the conventional observing mode is the main imaging technique of Sentinel-1 that provides free data to the public. However, there are some key processing issues that require more accuracy and need to be considered specifically.

Here we study the principles and methods of the TOPS SAR data interferometry. The methodology of registration, resampling and burst/sub-swaths splicing are analyzed. A pair of the Sentinel-1 TOPS SAR data is selected for D-InSAR processing to identify the areas suffer from Maoxian landslide. Due to large scale of deformation in such a short time, we can tell from the interferogram that the damaged area is completely decorrelated. This experiment clear reveals the damaged area suffered from the landslide disaster indicating InSAR is of great potential in natural hazards monitoring and identification especially under complex weather conditions such as heavy rain.

72 TITLE: Building damage detection from bi-temporal VHR image using object-based histogram of spatial homogeneity index

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KEY WORDS: Building damage detection, VHR image, object-based, spatial homogeneity index, histogram

ABSTRACT: Timely and accurate information about building damage caused by earthquake disasters is essential for disaster assessment, especially in the response and recovery phases. Very high resolution (VHR) remote sensing images make it possible to detect and assess earthquake-induced building damage because of their abundant fine-scale information. Most existing studies adopted object-based methods to extract building damage from VHR images, in which the average values of spectral-spatial features for each object were used. This study proposed a novel multi-stage method of building damage detection using object-based histogram of spatial homogeneity index (SHI) from bi-temporal VHR images. The SHI is a novel spatial homogeneity descriptor at pixel level, which is originally presented for extraction of pure pixels (endmembers). The proposed method can be summarized as follows. Vegetation and other land cover types with relatively homogeneous surface, such as intact buildings, ground surface and shadows, were first extracted using the post-event VHR image and masked out. Collapsed buildings were then extracted by classifying the combined

object-based spectral histogram and SHI histogram of the remaining area using Random Forest classifier. The proposed method was quantitatively evaluated and compared to two methods using bi-temporal QuickBird images over Bam, Iran, which was heavily hit by an earthquake in 2003. For these two methods, vegetation and other land cover types with relatively homogeneous surface were first masked out as in the proposed method. In the first method, collapsed buildings were extracted only using object-based spectral histogram. In the second method, object-based average values of spectral and SHI features of the remaining area were used to extract collapsed buildings. The experimental results showed that the proposed method outperformed the two comparative methods with increase of 4.2% and 6.4%, in the kappa coefficient. Therefore, the proposed method is effective in extraction of collapsed buildings, which is also applicable to other areas.

73 TITLE: Comparisons among methods of non-buildings identification based on post-earthquake polarimetric SAR images

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KEY WORDS: Earthquake, PolSAR, Building damage assessment, Non-building identification

ABSTRACT: Non-building identification based on post-earthquake polarimetric SAR images is very important for building damage assessment with polarimetric SAR images, because it can reduce the interference of non-building to the damaged building extraction. So, a good non-building identification method can improve the accuracy of building damage assessment. And with a highly accurate building damage assessment result, we can provide reliable decision-making support for disaster relief and post-disaster reconstruction. Non-building refers to natural objects and artificial structures other than houses, such as vegetation, soil, rivers, roads and so on. In the existing research, there are four mainly non-building identification methods based on post-earthquake polarimetric SAR images: (1) Threshold segmentation(TS) method characterized by entropy(H) and scattering angle α ; (2) H-a-Wishart classification method; (3) TS method characterized by Radar Vegetation Index(RVI), Shannon entropy and scattering angle α ; (4) TS method characterized by $\pi/4$ double-bounce scattering component of Pauli decomposition. These methods are all valid for non-building identification. But there are no comparisons on these four methods, so we can't know which method is better. In this paper, we use Radarsat-2 polarimetric SAR data in the Yushu earthquake area to compare the four methods. We evaluate the non-building recognition accuracy of each method, and then further assess the accuracy of building damage assessment after using this non-building identification method. According these two factors, we choose the best method. Finally, we discuss the quantitative impact of the accuracy of non-building identification on the accuracy of building damage assessment.

74 TITLE: Extracting deformation of the fifth North Korean nuclear test with D-InSAR

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KEY WORDS: the fifth North Korean nuclear test, D-InSAR, deformation

ABSTRACT: North Korea carried out the fifth underground nuclear explosion test on September 9, 2016, 9:30 am, while detecting 5.0 earthquake around the test area. The North Korea nuclear tests have caused China, South Korea and other neighboring countries to face nuclear radiation risk, as a blatant challenge to the nuclear non-proliferation regime. Therefore, many researchers have conducted a monitoring study on the North Korean nuclear test area. Monitoring methods include seismology, remote sensing, infrasound, underwater and radionuclide measurements Underground nuclear tests in the North Korea are often accompanied by earthquakes. The seismological method can locate the test points accurately, then uses the seismic data to invert the explosion equivalent and the burial depth of nuclear tests rapidly. The radar remote sensing can obtain the deformation zone of test area, providing a wide range of continuous deformation field for the nuclear test, and complement the seismological methods. In this paper, two Sentinel-1A radar images before and after the fifth nuclear test were used. And we utilize their phase information to monitor the deformation of the nuclear test area. And we give a continuous deformation in the range of about 250km × 83km around the fifth nuclear test point. The experimental results show that there are obvious interference fringes around the test point, and the overall trend of the line of sight is negative. And within the smaller rectangular area of 20' longitude, 10' latitude around the fifth nuclear test point, the overall trend of the line of sight is still negative, the maximum sinking is up to -5.913cm, away from the test area ,there is a certain range of uplift, up to 5.486cm.

75 TITLE: Comparison of the disasters of the prehistoric Lajia site and the modern Beichuan City

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ABSTRACT: The Lajia site in Qinghai Province is a prehistoric settlement occupied at the end of the Neolithic Age, while Beichuan City in Longmen Mountain region of Sichuan Province is a city built up in 1950s. Both the Lajia site and Beichuan City were devastated by earthquakes and earthquake-induced disasters. At ~1920 BCE, an earthquake first destructed the Lajia settlement, while a few months later, a catastrophic outburst flood induced by this earthquake swept off the damaged Lajia, and the subsequent mudflows buried Lajia at last. This massive outburst flood that ravaged Lajia may well be the origin of the legendary Great Flood which is relevant to the beginning of China's first dynasty. As for Beichuan City, violent ground shaking devastated most of the buildings and two giant landslides buried some districts thoroughly during the Wenchuan earthquake on May 12th, 2008; nearly a month later, a flood from a dammed lake caused by this earthquake drowned a small part of Beichuan, while at the end of September, a horrible debris flow buried a considerable part of

the leveled city deeply underground. Without supports from the China's central government and other provinces, the rebuilding of Beichuan would be impossible, and "cultural" in this region probably has collapsed and declined. In-depth observation of the modern major disasters concerning complicated causes and processes is of critical importance for studying the rare disasters in prehistoric and early historic period and comprehending the interactions between nature and cultures; in turn, understanding the catastrophic disasters in early history and prehistory would enrich our knowledge for disaster prevention and reduction, especially for those regions that are theoretically susceptible to major geological disasters while no historical record has been documented.

76 TITLE: Ancient seismite in Beijing, North China

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ABSTRACT: Seismic event deposits (seismites) have recently become a hot subject in sedimentology. Many kinds of seismites have been recognized in various sedimentary successions of different ages, in almost all sedimentary environments and from many geological settings around the world. Since 2011, a number of well-preserved carbonate liquefaction mounds, liquefaction dykes and a carbonate sand volcano have been found in the Mesoproterozoic Wumishan Formation (1550–1450 Ma) in the Western Hills of Beijing, North China. These features crop out in a roadcut near Zhuanghuwa Village, Mentougou District. All ten mounds occur in the same sedimentary layer and have rounded shapes with some concentric and radial fissures arising from the center. They range from 1.5 to 4 m in diameter and from 10cm to 30 cm in height. The carbonate sand volcano has a diameter of 110 cm and the 'crater' at the top has a depth of about 30 cm. Associated with these mounds and the sand volcano are many 'normal' sedimentary structures and nearly 30 layers of other kinds of soft-sediment deformation structures. The former include ripple marks, cross-bedding, stromatolites and desiccation cracks, indicating deposition in a shallow-water peritidal platform environment. The morphological features and the genesis of these liquefaction mounds are very similar to mounds formed recently by the great Wenchuan Earthquake of China (2008). Detailed thin-section study of the mounds found no signs of any kind of biological constructional process; instead it reveals some obvious fluidification and liquefaction characteristics. Seismically formed breccias have been found in the inner part of the mound and the carbonate clastic dykes, the intrastratal faults and folds have been found in the nearby strata. All these evidences have shown that these features are the products of Mesoproterozoic earthquake activities.

77 TITLE: The response of Southern Ocean to the late Pliocene Northern Hemisphere Glaciation: clues from isotopic and environmental magnetic records from core MV0502-04JC, Southwest Pacific Ocean

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KEY WORDS: Southern Ocean; Northern Hemisphere Glaciation; environmental magnetism; thermohaline

ABSTRACT: The formation of Northern Hemisphere Glaciation (NHG) is a very important geological event of Late Pliocene Climate Transition (LPCT), which has a significant impact on global thermohaline and carbon circulation. Southern Ocean is an ideal location for paleoceanographical studies due to its high deposition rate and well carbonate preservation. In this study, samples from depth 390-1020 cm of the sediment core MV0502-04JC (50° 20' S, 148° 08' W, water depth 4286 m) retrieved from the south margin of southwest Pacific basin are studied. Analysis indicates correlations between stable isotopes ($\delta^{18}\text{O}$ and $\delta^{13}\text{C}$) of foraminifera shells and environmental magnetic proxies including susceptibility (χ), coercivity, Mr/Ms, anhysteretic remanent magnetization (ARM), and that environmental magnetic proxies could reflect glacial-interglacial changes. It is suggested that before the Northern Hemisphere Glaciation (NHG, 2.7-2.4 million years ago), the transition of water mass is rapid, which results in similar carbon and oxygen isotopic signatures of northern and southern hemisphere. After NHG, the surface water density decreased, which causes the decrease in deep water formation. The Southern Ocean and North Atlantic, therefore, show distinct stable isotope values due to such weakened global thermohaline circulation. Meanwhile, the water mass of Southern Ocean has obvious stratification, which mainly leads to the less exchange between deep water mass and bottom water mass, the bottom water mass, therefore, becomes older and heavier. Such shift in thermohaline circulation before and after the NHG event is also evidenced in the magnetic properties of magnetofossils preserved in core MV0502-04JC. For example, magnetofossil assemblages with “harder” magnetic properties and, therefore, more elongated magnetosome particles, are observed within sediments after the NHG. Such contrasting magnetic properties before and after the NHG can be explained by changes in ocean stratification and water exchange. A decrease in bottom water ventilation, and, therefore, bottom water O₂ content, is expected to prompt magnetotactic bacteria that biomineralize more elongated magnetosome grains, as has been observed in the magnetofossil record in this study.

78 TITLE: Variation in deepwater conditions recorded by benthic foraminiferal assemblage and elements in the northern South China Sea during the MIS 6-MIS 5 transition

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KEY WORDS: Terrigenous input; productivity; oxygen content; dissolution; benthic foraminiferal species

ABSTRACT: Marine Isotope Stage 5 (MIS 5) is the last whole interglacial in 100-ky time scale before the Holocene. The research on the climate events during the MIS 6-MIS 5 transition contributes to understanding the climate change in Holocene which followed the Last Glacial Maximum. Based on analysis of the element ratios and species assemblages in Core MD12-3432 in the northern China Sea, we present a detailed record of series of

processes including terrigenous input, primary productivity, dissolution, oxygen content and foraminiferal preservation, which provide valuable information for predicting sea water hydrological properties and ecological species variations in the future. The high values of Si/Al and Ti/Al in MIS 6 indicates the erosion was weak, and it became strong in the following MIS 5. However, the productivity showed no response to the terrestrial erosion. According to the transition from high productivity in MIS 6 to low productivity in MIS 5, we infer that the rise of sea level caused by warming climate lead to less terrigenous input and thus lower productivity. The Ca/Ti and abundance of benthic foraminifera in MIS 6 were low and didn't respond to productivity. This can be explained by certain species foraminiferal dissolution caused by high productivity in microenvironment. The benthic foraminifera were less influenced by dissolution relatively. The relative percentages of infaunal species, such as *Textularia agglutinans*, *Sigmoilopsis schlumbergeri*, *Melonis pompilioides*, *Eggerella bradyi*, *Globocassidulina subglobosa* and *Pullenia bulloides*, are high in MIS 6 and low in MIS 5. On the contrary, the relative abundances of epifaunal species, consisting of *Triloculina affinis*, *Cibicidoides wullerstorfi* and *Epistominella exigua*, are high in MIS 5 and low in MIS 6. The productivity and oxygen content in deep water during glacial and interglacial account for this discrepancy.

79 TITLE: Effects of Mesozoic volcanic eruptions on exceptional preservation of fossils in lakes

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KEY WORDS: Jehol Biota; Mesozoic; volcanic eruptions; exceptional preservation; fossils

ABSTRACT: The Mesozoic Yanliao and Jehol Biota in northeast China have yielded numerous completely preserved fossils, such as feathered non-avian dinosaurs, birds, pterosaurs, mammals, insects, and plants. Most of the specimens show various aspects of exceptional preservation, ranging from clear impressions of the body outlines to traces of soft tissues (e.g., teleost air sac, eye spots, muscles, skins) and external body coverings (e.g., scales, feathers, hairs). These fossils are mostly preserved in lakes that were closely associated with frequent volcanic eruptions. The role that volcanic eruption played in the process of exceptional preservation in these lakes is far to be well understood. By reviewing the preservation condition of these fossils, such as degree of fragmentation, density and diversity, plan-view orientation, size frequency, type of biomineralization, and lithofacies of the fossil-bearing layers as well as their relationship with volcanic rocks, the causes of mass mortalities, transport and burial of the organism remains in these lakes are discussed. Cause of frequent mass mortalities, transport and rapid burial of the remains by pyroclastic sediments, and maturing of soft tissues by chaocoalification are considered to be the dominant environmental factors that influenced exceptional preservation of fossils in lakes associated with volcanism.

80 TITLE: Mass accumulation of Xinjiangchelyid turtles from the Jurassic Tupan Basin of Xinjiang, northwestern China

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KEY WORDS: Jurassic; turtles; taphonomy; drought; debris flow

ABSTRACT: The Middle-Late Jurassic was a significant period for the origin and early diversity of living turtles (Testudines). As a critical group for understanding the origin of the crown-group hidden-neck turtles (Cryptodira), xinjiangchelyid turtles were flourished in the Middle-Late Jurassic of central Asia. Recently, a horizon with mass accumulation of xinjiangchelyid turtles has been uncovered from the Jurassic Tupan Basin of Xinjiang, northwestern China, shedding lights into the taphonomy and paleoecology of primitive testudines. In the bed of mass accumulation, more than thousand turtles can be found in a site of ca. 236 square meters. Particularly, in the highest turtle concentration (20 m²), complete and articulated turtle skeletons are tightly packed at a density of up to 36 turtles per square meter. A more expansive zone (ca. 10 m × 30 m) contains approximately five, fully disarticulated turtles per square meter. It is likely that these aquatic turtles gathered in a retreating water hole in a riverine environment during a drought event, similarly as some extant turtles (e.g. *Emydura macquarii*), and they died when the habitat dried up. A following catastrophic rainfall event caused a debris flow, possibly channelized in a dry river, and such that complete turtles, disarticulated turtles, and mudstone clasts were transported by a short distance and then deposited. This taphonomic model is consistent with previous environmental reconstructions of the Turpan Basin during the late Middle Jurassic, when episodic breakdown of regional monsoonal circulation might have resulted in a seasonally dry climate with severe episodic droughts.

81 TITLE: Deep-time plant-soil interactions in a waterlogged environment: evidence from the Middle Jurassic of western Beijing, China

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ABSTRACT: Plant roots and rhizomes have long functioned in terrestrial ecosystem. Fossils representing belowground rhizomes and roots were collected from the top part of the Upper Yaopo Formation (Middle Jurassic) of the Yuejiapo section, which is located near Yuejiapo Village, Mentougou District, Beijing, China. Morphological studies of the plant fossils, and comparisons with extant rooting systems and the known fossil record, together with lithofacies analyses of the fossil-bearing rocks, provide new information on the fossil record of belowground plant structures, development of fern roots and plant-soil interactions during the Jurassic period. The plant communities of the Upper Yaopo Formation are characterized by diversified ferns, cycads, ginkgophytes, conifers, and other groups. Two floras are studied in detail. The flora-1 is interpreted as representing a *Cladophlebis*-dominated community, while the flora-2 is represented by only root fossils and thus still unknown in composition

due to lacking foliage specimens. The belowground tissues such as rhizomes and roots are in situ preserved, and we propose that they were probably produced by ferns and conifers. The first type of rooting system is various rhizomes and fine shoot-borne roots; and the second type, thick central taproot with different orders of lateral roots, probably representing a rooting system of some conifer plant. Three lithofacies, including the rhizome layer, the humus layer and the sedimentary supply layer, were examined in detail, with respect of their sediment texture, composition, bedding surface morphology, repetition cycles and fossil contents, suggesting a low energy environment, and commonly, within a setting of relatively shallow water.

82 TITLE: Triassic vertebrate biotas of South China: markers of Triassic biotic recovery from the end-Permian mass extinction

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ABSTRACT: The end-Permian mass extinction, the most catastrophic event in the history of life on Earth, led to a major turnover from typical Palaeozoic faunas and floras to modern ones. Thereafter, the Triassic (252-201 Ma) became a key time intervals during which the foundations of modern ecosystems were established both in the sea and on land. Our Chinese Triassic has a typical palaeogeographic outline “sea in the south and land in the north”. Marine rock succession of Triassic in South China well documents the recovery of marine life through a series of well dated, exceptionally preserved fossil Vertebrate Lagerstätten recorded during the last decades. Stratigraphically, those fossil Vertebrate Lagerstätten are yielded in different stratigraphic levels ranging from Early Triassic to early Late Triassic. Even more important, they match well with the main stages of the life and environment recovery after the end-Permian mass extinction and are markers of the expansions of modern marine ecosystems. After a quite short phase till the end of the Smithian (Olenekian, Early Triassic) a rather consistent fish fauna was present all around the Pangea coasts and was referred as fish/amphibian-dominated trophic level, however, in South China fossil-bearing layers in the top of the Helongshan Formation (end-Smithian in age) lack temnospondylian amphibians and the common fish genera (e.g., Saurichthys, Pteroniscus and Boreosomus) of TEFFs (Triassic early fish fauna). The following Chaohusaurus fauna, early late Spathian in age and recorded from the Middle and Upper Member of the Nanlinghu Formation, marks the invasion of reptiles into the sea and the onset of a complex ecosystem to fish/reptile-dominated trophic level. A major radiation of the fish/reptile-dominated trophic level occurred in the Pelsonian of Middle Anisian (Middle Triassic), represented by the key faunas of fishes and reptiles (i.e., the Panxian Fauna of the Guizhou Province and the Luoping Fauna of the Yunnan Province). Later on, the middle Ladinian Xingyi Fauna suggests a major faunal turnover, which may have indicated the transition of ecological types from nearshore to offshore and the early Carnian (Late Triassic) Guanling Biota, characterized notably by large-sized ichthyosaurs and crinoids, marks the full recovery from the end-Permian mass extinction of marine ecosystems.

83 TITLE: Investigation of the Late Devonian mass extinction: linkage between biodiversity crisis and perturbation of marine carbon cycle

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ABSTRACT: As one of the “Big Five” mass extinctions in Phanerozoic, the Frasnian-Famennian (F-F) event records the extinction of 40 % of marine invertebrate genera. The F-F boundary is defined by the first appearance of conodont *Palmatolepis subperlobata* as well as abundant occurrences of *Pa. ultima* at the base of Lower *Pa. triangularis* Zone. The F-F boundary is also broadly coincident with a positive excursion in carbon isotopes, suggesting the possible linkage between the perturbation of marine carbon cycle and biotic crisis. However, correlation between the conodont biostratigraphy and carbon isotope chemostratigraphy in high-resolution has not been properly established yet, preventing high resolution regional stratigraphic correlation among different sedimentary facies. In this study, we conducted systematic conodont biostratigraphic study and carbonate carbon ($\delta^{13}\text{C}_{\text{carb}}$) and organic carbon ($\delta^{13}\text{C}_{\text{org}}$) isotope chemostratigraphic analyses of the Baisha section in the Guangxi Province, South China. In the Baisha section, $\delta^{13}\text{C}_{\text{carb}}$ shows a 3 ‰ positive excursion, predating a ~5 ‰ positive excursion in the $\delta^{13}\text{C}_{\text{org}}$. The first appearance of index conodont *Pa. subperlobata* for the Lower *Pa. triangularis* Zone was coincident with the onset of positive excursion in $\delta^{13}\text{C}_{\text{carb}}$, earlier than the disappearances of *Pa. linguiformis* and other typical Frasnian elements. *Pa. triangularis* and *Pa. subperlobata* occurred nearly simultaneously in the Baisha section. In addition, the first appearance of *Pa. delicatula*, which is the index fossil for the Middle *Pa. triangularis* Zone, was coincident with the climax of $\delta^{13}\text{C}_{\text{org}}$ and the beginning of $\delta^{13}\text{C}_{\text{carb}}$ decline. Another important Famennian element *Pa. minuta*, the index fossil for the Upper *Pa. triangularis* Zone, first appeared when $\delta^{13}\text{C}_{\text{org}}$ started to decline. The offset of $\delta^{13}\text{C}_{\text{org}}$ and $\delta^{13}\text{C}_{\text{carb}}$ excursions might be attributed to the oceanic anoxia and stratification near the F-F boundary, followed by the mixing of the surface and bottom water in the earliest Famennian. The high resolution bio- and chemostratigraphic framework from the Baisha section can be used as a standard for the regional stratigraphic correlation and identification of F-F boundary in different depositional environments in South China. We propose that F-F boundary can be recognized from a conodont-poor carbonate section by the onset of positive excursion in $\delta^{13}\text{C}_{\text{carb}}$, whereas the F-F boundary in a non-fossiliferous siliciclastic section might be placed slightly below the positive excursion in $\delta^{13}\text{C}_{\text{org}}$.

84 TITLE: Mass extinctions in geological times and implications for modern biodiversity

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KEY WORDS: Mass extinction event; Big Five; biodiversity loss; pre-historical disaster

ABSTRACT: The diversity of both marine and continental life increased through the geological times, but this increasing trend was interrupted by several mass extinction events,

which had decreased the observed numbers of family, genus and species of organisms in the fossil record. It seems to be a consensus that there were five mass extinction events during the Phanerozoic (from 540 million year ago to the present day), as famously known as the “Big Five”, including: Late Ordovician; Late Devonian; end-Permian; end-Triassic; and end-Cretaceous. However, some suggested that there were more than 18 extinction events, with different magnitudes of biodiversity loss. The most severe biodiversity crisis is the one that happened during the end-Permian (ca. 252 million years ago), when more than 70% of marine animal genera became extinct within a 200,000-year interval. It is clear that such a mass extinction event represents a severe pre-historical disaster to the evolution of organisms including vertebrates. Many mechanisms have been suggested to be the potential causes of mass extinctions, including: volcano eruptions; bolide impacts; catastrophic methane release; climate changes; sea level changes; etc. Nevertheless, no clear evidence shows that global cooling or warming could certainly lead to a mass extinction. Many lines of geological evidence indicate that some groups of organisms radiated during a greenhouse period. The intensification of the activities of human beings, combining with the evolution of the Earth’s environments, has threatened the modern biodiversity. However, compared with the geological data, it is likely that the biodiversity loss of the present day does not reach the magnitude of the “Big Five” and thus does not represent “the sixth mass extinction.”

85 TITLE: How early vascular plants survive frequent fluvial floods: evidence from a 410-million-year plant and its roles in landscape stabilization

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KEY WORDS: rhizome; paleosol; clonal growth; fluvial landscape; Devonian

ABSTRACT: Frequent fluvial floods are not uncommon in the deep-time stratigraphic record, and the interplay between floods and terrestrial organisms became evident since the colonization of land by life. The colonization of terrestrial environments by vascular plants since the mid-Paleozoic, ca. 430 million years ago, was a key event, as life moved from the water to land. The ca. 410-million-year Xujiachong Formation exposed in Qujing, Yunnan, China, represents a suite of well-preserved fluvial deposits. This formation consists of at least 93 sedimentary cycles, each of which is interpreted to represent a river channel migration or episodic crevasse splay followed by floodplain development. Red mudstones (paleosols or fossil soils) with plant traces developed as floodplain deposits. Belowground rhizomes of the basal lycopsid *Drepanophycus* is well preserved in early soils. These rhizomes produced large clones and helped the plant survive frequent sediment burial in well-drained soils within a seasonal wet-dry climate zone. Rhizome networks contributed to the accumulation and pedogenesis of floodplain sediments and increased the soil stabilizing effects of this small, herbaceous plant. Clonal growth, as an important strategy of plant vegetative reproduction, has been well established in the early phase of vascular plant evolution. The study of clonal growth of *Drepanophycus* in early soils presents strong, direct evidence for plant-soil interactions at an early stage of vascular plant radiation. Soil stabilization by

complex rhizome systems was apparently widespread, and contributed to landscape modification at an earlier time than had been appreciated.

86 TITLE: From Structural Mitigation to Comprehensive Risk Governance: The Change Course and Future Direction of Disaster Prevention and Control Mode

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KEY WORDS: Compound disaster; Compound mitigation; Emergency management; Comprehensive risk governance.

ABSTRACT: Environmental vulnerability caused by climate changes and unscientific development has made the compound trend and characteristic of disasters more pronounced. In order to effectively cope with the frequently-occurring compound disasters, scholars have successively come up with three concepts of disaster governance: Structural Mitigation based on engineering and technological methods, Non-structural Mitigation based on planning and educational methods and compound mitigation based on the previous two solutions. The compound mitigation is characterized by both “systematic mitigation” and “stereoscopic mitigation”, and to a large extent resolved the dilemma of single Structural Mitigation or single Non-structural Mitigation. However, its emphasis is still on natural disasters such as earthquakes, floods, hurricanes, droughts, etc. Facing the growing possibility of multiple risk events striking which include natural disasters, accident disasters, large-scale infectious diseases, social security incidents and even military conflicts, more emphasis is needed to put on beyond natural disasters to meet the demands of comprehensive governance for all types of risks, such as disasters, accidents, events, etc. This article analyzes the possibility of compound occurrence of different types of risks such as natural disasters, accident disasters, public health accidents, social security accidents, and establishes a basic framework of comprehensive risk governance theory from “full-view analyzed, all types covered, whole-process managed, all participants involved, and all methods applied” perspectives.