



INTERNATIONAL SCHOOL FOR GEOSCIENCE RESOURCES (IS-Geo)
KOREA INSTITUTE OF GEOSCIENCE AND MINERAL RESOURCES (KIGAM)

REGULAR TRAINING COURSE ON Landslide Monitoring and Assessment

The **International School for Geoscience Resources** of KIGAM presents an intensive training course on **"Landslide Monitoring and Assessment"**. The course will take place at the Ara room of International School for Geoscience Resources of KIGAM in Daejeon (Korea) from **August 18 – September 1, 2014** and includes the following **2 modules**.

Modules	Date	Representative Lecturers
Module 1. Landslide Monitoring and Early Warning Topic 1. Introduction and basics of landslide risk prediction Topic 2. Statistical and deterministic EW for rainfall induced landslides Topic 3. Advances in landslide monitoring Topic 4. Exercise day Topic 5. Data integration and module wrap-up	8.18-22	Filippo Catani (University of Firenze, Italy)
Module 2. Landslide Hazard and Risk Assessment Topic 1. Landslide inventory Topic 2. Landslide initiation analysis Topic 3. Landslide runout assessment Topic 4. Landslide vulnerability assessment Topic 5. Landslide risk assessment	8.25-29	C. J. van Westen (University of Twente, The Netherlands)
Country Report Workshop	9.1	IS-Geo



COURSE INFORMATION

- **Agenda**

This course will provide a basic and intermediate introduction to the principles and practical methods of landslide monitoring and early warning. The participants will be facing state-of-the-art techniques and methodologies to expand their capabilities and understanding on the course topics. In addition, in the module 2 it aims to provide an overview of the state of art in relation to landslide susceptibility, vulnerability and risk assessment.

- **Course Covered**

Module 1 will provide basics of landslide monitoring with special emphasis on remote sensing methods and early warning techniques at different scales of application, from the slope scale to the national extent. The learning flow will be guided by the need of furnishing participants a practical application background in landslide prediction techniques, starting from basic principles towards more in-depth topics concerning threshold methods, deterministic modelling, and real-time monitoring.

Module 2 will provide to list the various methods for landslide inventory assessment, to decide which methods are most applicable for landslide initiation and runout assessment at different scales and in different settings, to outline the difficulties involved in expressing hazards, vulnerabilities and risk in quantitative terms, and to understand the importance of spatial information for landslide hazard and risk assessment.

- **Course Requirements: Prerequisite**

The participants should have a background in one of the following fields: Geology, Geography, Civil Engineering, Environmental Engineering, Engineering Geology or other Earth Science disciplines. Participants must have a good knowledge of the English language as the course will be conducted in English as well as using the computer.

Particularly for Module 1, the participants should be acquainted with the basic principles of remote sensing and intermediate principles of geotechnics and geomechanics, soil behaviour and landslide modelling.

- **Who should Attend?**

This course is designed for scientists, researchers, engineers involved in landslide studies with special emphasis on those interested in engineering and geological applications of landslide prediction at different stages of risk mitigation, both in the academic, public and the private consultant sectors.

Module 1. Landslide Monitoring and Early Warnings - Dr. Filippo Catani

- **Summary of topic contents and learning objectives**

The opening day of this module will be used to assess the background level of participants in order to tailor the lessons to the needs and capabilities of the participants. Furthermore, the first day will be devoted to learn the basic principles of landslide monitoring and early warning, including, but not limited to, general definitions, landslide classification, triggering mechanisms, susceptibility factors and an overview of the monitoring tools nowadays available on the market.

- **Day 1. Introduction and basics of landslide risk prediction**

After an initial fast assessment of the participants' background on the disciplines of landslide risk reduction, the first day will be devoted to learn the basic principles of landslide monitoring and early warning, including, but not limited to, general definitions, landslide classification, triggering mechanisms, susceptibility factors and an overview of the monitoring tools nowadays available on the market.

- Orientation test
- Landslide risk definitions and basics
- Landslide causative factors and susceptibility: which environmental factors are key for landslide prediction?
- Monitoring tools: an overview

- **Day 2. Statistical and deterministic EW for rainfall induced landslides**

Basic and advanced methods of landslide monitoring will be reviewed for rainfall triggered landslides with special regard for ground-based techniques based on both traditional and new methods. Introduction to landslide deterministic modelling in distributed environments, basin-scale application, real-time prediction based on rainfall radar measurement and meteorological models

- Rainfall patterns and landslide triggering
- Case studies and state of the art
- Rainfall thresholds methods for landslide prediction
- Variable rainfall thresholds
- Deterministic modelling of rainfall induced slope failure
- Model sensitivity and key parameters

- **Day 3. Advances in landslide monitoring**

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Basic state of the art for landslide monitoring, including ground, airborne and spaceborne instruments will be provided. Special emphasis will be devoted to new technologies and in particular, InSAR methods. A brief review will be given concerning the traditional in-situ instrumentation for monitoring of displacements and triggering factor (such as e.g. ground water table), then a more in-depth analysis will be carried out on the use of remote sensing methods.

- Basic landslide displacement monitoring
- Basic landslide triggering parameters monitoring
- Advanced techniques for displacement monitoring at the slope scale: ground-based sensors with special reference to InSAR
- Advanced techniques for displacement monitoring at the basin-scale: airborne and spaceborne sensors with special reference to InSAR
- Elements and case studies for EW based on remote sensing techniques

- **Day 4. Exercise day**

The whole day time will be used to familiarize with monitoring data over real cases using simulations and examples to understand possible methods of setup for EW systems. In particular, after a brief primer on displacement time series management, we will perform a series of simple practical exercises on the computer to give the participants an operative understanding of the use of what has been presented in the first 3 days of this module.

- Introduction to the material for the exercise
- Rainfall data analysis
- PS-InSAR data analysis

- **Day 5. Data integration and module wrap-up**

The fifth and last day of the module will be devoted to the aspects of landslide monitoring and early-warning not treated in the previous days. It will also be used to build a final wrap-up of all the materials and methods towards a data integration strategy for the purposes of early warning and decision support systems in risk management as related to landslide hazard.

- Specific topics on landslide monitoring
- Specific topics on landslide prediction and early warning
- Data integration
- Module wrap-up
- Open questions



Module 2. Landslide Hazard and Risk Assessment - Dr. Cees Van Westen

- **Summary of module content and learning objectives**

At the end of the module the participants will be able to list the various methods for landslide inventory assessment, to decide which methods are most applicable for landslide initiation and runout assessment at different scales and in different settings, to outline the difficulties involved in expressing hazards, vulnerabilities and risk in quantitative terms and understand the importance of spatial information for landslide hazard and risk assessment.

- **Day 1. Landslide inventory**

This first day will give an overview of the methods used for landslide inventory analysis and will illustrate this with a number of examples. In the afternoon the participants get hands on experience using a landslide inventory for the Wenchuan earthquake (China)

- Introduction to landslide processes
- Methods for landslide inventory assessment
- Exercise: analysing a large landslide inventory for the Wenchuan earthquake in China

- **Day 2. Landslide initiation analysis**

This day will be devoted to methods used for landslide initiation susceptibility and hazard assessment at different scale, looking at heuristic, statistical and deterministic methods.

- Scale of analysis, input data and selection of assessment method
- Heuristic, statistical and deterministic methods for landslide susceptibility assessment
- Exercise: simple statistical landslide susceptibility assessment, using weights of evidence method
- Exercise: simple deterministic landslide susceptibility assessment, using infinite slope modelling



- **Day 3. Landslide runout assessment**

This day will be used to look at different methods for landslide runout assessment, ranging from empirical methods at a regional scale to numerical simulation methods at a local scale.

- Scale of analysis, input data and selection of landslide run-out assessment methods
- Empirical and numerical methods for landslide run-out assessment
- Exercise: simple run-out assessment at the regional scale using the FLOW-R model

- **Day 4. Landslide vulnerability assessment**

This day will be used to analyse the elements at risk exposed to landslide hazards, focusing on buildings, population and transportation infrastructure, and on the methods used for analysing vulnerability.

- Classification of elements at risk and their vulnerability for landslides
- Methods for landslide vulnerability assessment
- Exercise: application of qualitative vulnerability assessment method using spatial multi-criteria evaluation.

- **Day 5. Landslide risk assessment**

The last day of the module is dedicated to the methods used for landslide risk assessment. The landslide risk framework is presented, and different methods for qualitative and quantitative risk assessment are shown.

- Landslide risk assessment framework
- Landslide risk assessment methods used at different scales
- Exercise: quantitative landslide risk assessment: the Nocera case study, Italy
- Module evaluation and wrap-up

About the instructor – Dr. Filippo Catani



Dr. Catani, a Senior Research Geologist with the Natural Hazards Group at the Earth Sciences Department of the University of Florence, is Associate Professor of Applied Geomorphology, Remote Sensing and Geographic Information Systems with the School of Sciences of the University of Florence (Italy).

He has a PhD in Engineering Geology acquired at the joint consortium of Politecnico of Milan, University of Milan, Padua and Ferrara, Italy. A BSc in Applied Geochemistry from the University of Florence (Italy) and a BSc in Computer Sciences from the Regional Tuscan Administration Advanced Study Academy.

During his career he has been visiting scholar at the Faculty of Civil and Environmental Engineering at the Massachusetts Institute of Technology (MIT), Cambridge, Massachusetts (1998-1999), Associate Researcher at Italian National Research Council (CNR, 2000-2005) and member of the Board of Directors of the University of Florence (2008-2010).

His main research interests range from slope scale landslide risk assessment to basin scale surface process modelling and mapping, with special reference to the use of novel technologies and remote sensing. Lately, he has been working on topics such as: shallow landslides modelling and real-time prediction, rainfall triggering of landslides, land-surface parameter monitoring and data uncertainties, InSAR and PS-InSAR monitoring of surface displacements, statistical methods for landslide hazard and risk assessment, remote sensing of landslides and surface processes. On these and other topics, he is author or co-author of more than 100 scientific publications.

He is the assistant to the President of the International Consortium of Landslides (ICL, 2011-2013), Core Member of the joint ISSMGE-IAEG-ISRM Committee JTC2 on "Representation of Geo-Engineering Data in Electronic Form" and member of the NASA-JPL InterDisciplinary Team on Remote Sensing. It is guest editor for the journals Landslides (Springer) and NHESS (EGU). He is also peer reviewer of several of the main journals dealing with topics related to natural hazards, engineering geology and geomorphology, earth surface geophysics and the remote sensing of the environment.

About the instructor - Dr. Cees Van Westen



Dr. Cees Van Westen is the associated professor in the Department of Earth Systems Analysis of the Faculty of Geo-Information Science and Earth Observation (ITC), University of Twente, the Netherlands. He obtained his MSc in Physical Geography from the University of Amsterdam (1988) and his PhD in Engineering Geology from the Technical University of Delft (1993), with emphasis on Geographic Information Systems for Landslide Hazard Zonation.

Since 2005 he is Director of the United Nations University - ITC School on Geo-information for Disaster Risk Management (<http://www.itc.nl/unu-drm>). He received the ITC research award in 1993 and the Richard Wolters Prize of the International Association of Engineering geology (IAEG) in 1996.

He is specialized on topics related with the use of spatial information for landslide hazard and risk assessment, participatory GIS for flood risk assessment, volcanic hazard assessment, seismic hazard and risk assessment, technological risk assessment, and multi-hazard risk assessment. Most of his research is in the field of landslides, dealing with topics such as: generation of event-based landslide inventories using remote sensing, historical records and field mapping; combination of heuristic and statistical models for landslide susceptibility analysis; dynamic modeling of landslide initiation; landslide run out analysis, and different approaches for landslides risk assessment.

He has published over 45 papers in ISI journals, 10 book chapters, and numerous papers in conference proceedings. He has been involved in many projects funded by the EU (FP6, FP7), World Bank, ADB, Dutch government, US-AID, etc. He is currently project coordinator of the CHANGES project, an EU FP7 Marie Curie International Training Network. In the course examples will be given from a recent European research project on landslide risk assessment and management, called SAFELAND (<http://www.safeland-fp7.eu/Pages/SafeLand.aspx>). For more information, please visit: http://www.itc.nl/about_itc/resumes/westen.aspx



GENERAL INFORMATION

- **STARTING/END DATE AND LOCATION**
 - ✓ **August 18 through September 1 (3 weeks) at KIGAM in Daejeon, Korea.**
- **LANGUAGE OF STUDY**
 - ✓ The language of instruction is English and the courseware is in English.
- **ASSESSMENT AND CERTIFICATION**
 - ✓ A participant will receive the certificate upon completion of the course.
- **REGISTRATION**
 - ✓ **Deadline – By July 18 for a nominee**
Before 7 days in starting date of each module for someone else except for a nominee
 - ✓ **How to Register**
 - Complete and return the attached form, “Nomination form” for a nominee and “Registration form” for someone else except for a nominee to Mr. Seung-Ryeol Hwang (hwang3816@kigam.re.kr) by email
 - Visit at <http://isgeo.kigam.re.kr>, IS-Geo URL. You can learn more about all training courses in IS-Geo website.
- **COURSE FEE**
 - ✓ The fee for each module contains the access to electronic course notes, the certificate of attendance and the Pre-Course e-Learning.
 - ✓ **The fee for a nominee is free.**
 - ✓ The fee to someone else except for a nominee in each module is 500 US dollars /500,000 KRW per module (100 US dollars/100,000 KRW per module for only students).
- **CONTACT**
 - ✓ For more inquires about training courses of IS-Geo, please contact at any time
 - ✓ **Mr. Seung-Ryeol Hwang**, Assistant Coordinator by phone at +82-42-868-3816 or by email at Hwang3816@kigam.re.kr

