UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Environmental Monitoring and Management

2425-2-F9102Q011

Aims

The aim of this course is to provide students with an understanding of environmental monitoring techniques, with management practices in view. Students will learn the principles of environmental monitoring, the techniques used for collecting data, and the processes involved in managing and analysing the collected data. The course will focus on spaceborne radar but will also include GNSS and in-situ data where relevant. A part of the course will aim at introducing students with practical examples of real cases of study of remote-sensing techniques applications. This will include GIS analyses focused on InSAR-based slope monitoring and correlations with in-situ instruments (inclinometers, GNSS) for deep slow-moving landslides. By the end of the course, students will be able to critically evaluate different approaches to environmental monitoring and management and develop effective strategies to collect environmental data.

Contents

This course provides students with an understanding of how to monitor the environment using spaceborne radar remote sensing and in-situ sensors. The principles of operations of a radar system and the meaning of the data it produces will be presented as a means to understand environmental application of related information collection and extraction activities.

A brief introduction will be also made on the main elements of some geological processes related to slope instabilities, land subsidence, earthquakes and their monitoring, from space (radar remote sensing) and in-situ (inclinometers, GNSS). Some cases studies will be addressed, analysing and processing data. Practical exercises in GIS environment, producing thematic maps derived from geological monitoring of instabilities processes, will be presented.

Detailed program

Introduction to Environmental Monitoring and Management:

Radar Remote Sensing:
? Principles of radar remote sensing
? Types of radar sensors and their applications
? Data collection, processing, and interpretation
? Copernicus and its Data Hub

Merger with in-situ data and application examples
? Introduction to in-situ sensors (inclinometers-GNSS-extensometers)
? Basic elements of GIS
? In-SAR data and interpretation: GIS analysis
? Landslides and subsidence: geological implications
? Radar monitoring of surface deformations after earthquakes
? Alpine and Apennine deep slow-moving landslides In-SAR Sentinel monitoring
? In-SAR PS time series analysis and in-situ inclinometers/GNSS data comparison
? An extraterrestrial example: analysis of Martian subsurface with MARSIS geo-radar

Note: The order and content of topics may be adjusted to better fit the background of students and to keep the information current.

Prerequisites

Students should have acquired some background from previous courses in environmental science, geospatial analysis, remote sensing, or a related field before enrolling in this course. Basic proficiency in relevant software such as GIS (Geographic Information Systems) software and remote sensing software may also be useful. Knowledge of the basics of computer programming is not required but strongly recommended.

Teaching form

The course will include traditional lectures, where the instructor presents the course material and engages students in discussions and debates, and lab sessions, where students get hands-on experience working with radar remote sensing and in-situ sensor networks.

Textbook and teaching resource

• Moreira, A., P. Prats-Iraola, M. Younis, G. Krieger, I. Hajnsek and K. P. Papathanassiou, "A tutorial on synthetic aperture radar," in IEEE Geoscience and Remote Sensing Magazine, vol. 1, no. 1, pp. 6-43, March 2013, doi: 10.1109/MGRS.2013.2248301.

• Massonnet, D. and Souyris, J.C., “Imaging with Synthetic Aperture Radar” in Engineering Sciences series, EPFL Press, 2008. ISBN 978-0849382390

• Crosetto, M And Solari, L: Satellite Interferometry Data Interpretation and Exploitation. Case Studies from the

European Ground Motion Service (EGMS). Elsevier. Paperback ISBN: 9780443133978 eBook ISBN: 9780443133985.

• Slides of the lessons published on the course site

Semester

1st semester

Assessment method

Oral exam

Office hours

By video- or audio-conference on appointments set via email.
Office: University of Pavia, Department of Electrical, Computer, Biomedical Engineering, via Adolfo Ferrata 5, 27100 Pavia – floor H, by appointment.
Phone: +39-0382-985664
Email: mailto:fabio.dellacqua@unipv.it
Web: http://tlclab.unipv.it/index.php/people/the-team/23-people/75-fabio-dell-acqua

Sustainable Development Goals

SUSTAINABLE CITIES AND COMMUNITIES | CLIMATE ACTION