

# Satellite-based Flood Hazard Mapping

**Duration:** 20 hours

**Teacher(s):**

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**Where:** to be decided

## Abstract

Floods are the most frequent hazard worldwide; big floods always rank among the costliest disasters producing very high social and economic impacts. These impacts are particularly relevant in highly exposed and vulnerable areas (urban and agricultural areas) that are also the most important targets for institutions involved in emergency management (e.g. public agencies, governmental authorities), as well as for insurance companies that have to assign compensations for damages. It is well known that floods can be mapped and monitored with remotely sensed data acquired by aircraft and satellites. The sensors and data processing techniques that exist to derive information about floods are numerous. Instruments that record flood events may operate in the visible, thermal and microwave range of the electromagnetic spectrum. Due to the limitations posed by adverse weather conditions during flood events, active radar (SAR and altimetry) is invaluable for monitoring floods. There have been notable studies on integrating remotely sensed data with flood modeling since the late 1990s and there is now a general consensus among space agencies to strengthen the support that satellite missions can offer. This trend has stimulated more research in this area, and significant progress has been achieved in recent years in fostering our understanding of the ways in which remote sensing can support flood hazard monitoring and management.

The course is divided into three parts. In the first part (Prof. Boni) the principles of management and mapping of flood hazard will be presented. The second part (Dr. Pulvirenti) will be devoted to the satellite-based techniques of flood mapping with a specific focus on techniques based on SAR observations. The last part of the course (Dr. Cenci) will allow students to make direct contact with the software and image processing techniques for the identification of flooded areas from satellite

## Program

Introduction to risk management and flood hazard management (6 hours) – Prof. G. Boni

Introduction to flood mapping from satellite (6 hours)– Dr. Luca Pulvirenti

Exercise (8 hours): SAR image processing (Sentinel-1) and extraction of flooded areas – Dr. Luca Cenci

## References

1. Global Assessment Report on disaster risk reduction  
<http://www.preventionweb.net/english/hyogo/gar/2015/en/home/>
2. CEOS SATELLITE EARTH OBSERVATIONS IN SUPPORT OF DISASTER RISK REDUCTION,  
<http://www.eohandbook.com/eohb2015/>
3. Ulaby, F. T., R. K. Moore, and A.K. Fung, Microwave Remote Sensing: Active and Passive, Vol. I -- Microwave Remote Sensing Fundamentals and Radiometry, Addison-Wesley, Advanced Book Program, Reading, Massachusetts, 1981, 456 pages.
4. Ulaby, F. T., R. K. Moore, and A.K. Fung, Microwave Remote Sensing: Active and Passive, Vol. II -- Radar Remote Sensing and Surface Scattering and Emission Theory, Addison-Wesley, Advanced Book Program, Reading, Massachusetts, 1982, 609 pages.
5. Ulaby, F. T., R. K. Moore, and A. K. Fung, Microwave Remote Sensing: Active and Passive, Vol. III - - Volume Scattering and Emission Theory, Advanced Systems and Applications, Artech House, Inc., Dedham, Massachusetts, 1986, 1100 pages.
6. Sentinel Toolboxes tutorial <https://sentinel.esa.int/web/sentinel/toolboxes/sentinel-1/tutorials>