



Università Tor Vergata, Roma

Ingegneria Civile e Ingegneria Informatica

GeoInformation PhD Curriculum

5th 2013 GeoInformation Seminar

DISP meeting room, Ingegneria dell'Informazione, 1 Via del Politecnico
21 March 2013, starting at 15:00

Andrea Gerardi

Dynamic mapping of flood boundaries: current potential of Earth Observation Systems and Cellular Automata

Recent studies show that flooding events are becoming more frequent and with increasing impact: the formation of new paths of water, breaking banks, and penetration into urban networks are relevant consequences. A major challenge is the implementation of a system able to monitor and forecast the progression of the water fronts according to the structure of the terrain and the weather conditions.

The proposed solution consists of a software that from appropriate input data simulates the evolution of the water course based on the inflows-outflows theory. The evaluation of the characteristic accuracy of the developed software has been carried out by analyzing a set of RADARSAT-2 images before and after a flood event in the lower basin of the Aniene River. The results, obtained through the Nest 1.4.c tool, show that although the simulated water front pattern is varied and complex, the simulations are very close to the real evolution of flooding and the flooded areas are clearly identified.

It is believed that the tool under development can make easier and faster the estimate of the progression of the water fronts and can prove useful in disaster prevention.

Andrea Gerardi received his MS degree in Computer Engineering from Unisalento University, Lecce, Italy and is currently pursuing the GeoInformation Curriculum Ph.D. degree at the Tor Vergata University.

His research activity involves the development of a software tool for mapping flood boundaries through cellular automata and Earth Observation Systems.

Cristina Vittucci

Role of microwave signatures in flooding events and soil moisture monitoring

The continuous spatial and temporal monitoring of soil moisture is of particular importance to the hydrological water cycle, from the cloud generation to the sub-surface reservoirs. This research investigates the retrieval of the soil water content from data acquired by space-borne microwave passive instruments. The study area is the lower Bermejo basin, a subtropical area of Argentina, mostly spread by moderately dense forests, which is seasonally affected by severe flooding events.

A sensitivity analysis at several microwave bands has been carried out. In particular, the performance of the L-band SMOS measurements has been compared with the one of the C- and X-band AMSR-E data takes. The superior performance of the lower frequencies, due to the weaker interaction with the vegetation structures, is highlighted. The capability of passive remote sensing instruments to record brightness temperature variations due to rainfall and floods occurred near river edges under different seasonal conditions is confirmed, thus supporting the effectiveness of microwave radiometers as a monitoring tool. The measured brightness temperature is not directly correlated with streamflow but, being sensitive to soil moisture, can detect surface conditions prone to saturation and to the development of flooding events. Based on this idea, an adaptive model has been developed to forecast the river water level using radiometric data, from K_a - to L-bands.

Finally, data collected over South Australian forests by airborne passive and active L-band instruments will be presented together with a preliminary sensitivity analysis against the ground measurements collected during the SMAPEX-3rd campaign.

Cristina Vittucci obtained the MS degree in Environmental Engineering in 2007 from La Sapienza University, Rome, with a dissertation on "Hydrologic validation of satellite water level measurement", carried out at ESA. In 2009 she attended the specialization school in "GIS and Remote Sensing Techniques for Geo-environmental planning" at the University of Roma Tre. She is concluding her Phd in Geoinformation at the Tor Vergata University in Rome, working on soil moisture active and passive microwave signatures. From 2008 to 2010 she has been working on GIS projects at ESRI and SELEX Sistemi Integrati and in September 2011 she joined the third SMAPEX Campaign, in Yanco, Australia.

You are cordially invited to attend.

<http://www.disp.uniroma2.it/geoinformation/>