SCIENCES & BIOENGINEERING SCIENCES

The Research Groups

Cartography and GIS - Physical Geography

have the honor to invite you to the public defense of the PhD thesis of

Sophie MOSSOUX

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:

Risk assessment around Karthala volcano, Union of the Comoros: Modelling lava flow hazard, population exposure and road access vulnerability, and building resilience against volcanic eruptions

Supervisors:

Prof. Dr. Frank Canters
Prof. Dr. Matthieu Kervyn

The defence will take place on
December 3 2018 at 16.00h

in Auditorium K.2.01 P. Janssens at the Campus Humanities, Sciences and Engineering of the Vrije Universiteit Brussel, Pleinlaan 2 - 1050 Elsene, and will be followed by a reception.

Members of the jury:

Prof. Dr. Kobe Boussauw (chairman)
Prof. Dr. Tom Vanwing (secretary)
Dr. Alicia Felpeto (Instituto Geográfico Nacional)
Prof. Dr. Catherine Linard (Université de Namur)

Curriculum vitae

Sophie Mossoux studied geography at UCLouvain and started a research project on volcanic risk assessment at the VUB in 2012.
For her research she undertook three field missions and spent three months on Ngazidja Island (Union of the Comoros) collecting ground truth and conducting community-based surveys. Sophie published three peer-reviewed papers on her PhD work and one publication aimed at a wide audience.
As a teaching assistant, Sophie developed and guided training classes in GIS and remote sensing and was involved in the supervision of bachelor and master theses.

Abstract of the PhD research

Ten percent of the world population lives within a 100km radius of an active volcano. Strategies must be defined to make these communities less vulnerable and more resilient to future threats. The risk to be affected by a volcano can be reduced by putting in place different measures. Prior to an event, the potential hazards must be well understood, mapped and monitored. Human settlement exposed must be identified. The vulnerability and the expected damage of exposed elements must be assessed. Good communication between the different actors involved is critical, and collective awareness about existing hazards must be raised.
In this PhD research, we propose approaches requiring limited resources for volcanic risk assessment in data poor settings. The methods are applied on the volcanic Ngazidja Island (Union of the Comoros). Because the lower flanks of the active Karthala volcano are highly populated, the chance of residents being affected by future eruptions is real. Moreover, as resources and human competences to face volcanic crises on the island are limited, the risk is even more important.
To improve our understanding of the spatial distribution of lava flow hazard, assist land use decisions and support evacuation planning during a volcanic crisis, a lava flow hazard map is produced with an own developed, open-source simulation tool, Q-LavHA. The tool combines existing probabilistic and deterministic models, is easy to use, and is shown to produce reliable simulation results on various volcanoes. To model population exposure to lava flow hazard in the absence of up-to-date population census data a method for population assessment is proposed combining dedicated fieldwork with very high spatial resolution remote sensing. Data on population distribution is further used to assess the vulnerability of the road network in providing access to vital services. In the last part of the research, a serious game, Hazagora, is proposed to improve the resilience of adults through increased awareness of hazards and risk reduction strategies. Hazagora has been tested in different contexts and appears to be an effective, fun learning tool introducing participants to the concepts of geohazards and disaster and generating discussion on risk management and risk reduction strategies.
By presenting approaches for volcanic risk assessment, which can easily be transferred to other settings, this PhD research seeks to contribute to an improved management of natural risks in data poor settings.