

Hazard analysis in active landslide areas in the State of Veracruz, Mexico

Martina Wilde (1), Wendy V. Morales Barrera (2), Sergio R. Rodriguez Elizarrarás (2), Elizabeth Solleiro Rebolledo (2), Sergey Sedov (2), and Birgit Terhorst (1)

(1) Institute of Geography and Geology, University of Wuerzburg, Wuerzburg, Germany (martina.wilde@uni-wuerzburg.de),

(2) Institute of Geology, National Autonomous University of Mexico, Mexico City, Mexico

The year 2013 was characterized by strong storms and hurricanes like the Hurricanes Barbara and Ingrid and the tropical storms Barry and Fernand, which occurred between June and November affecting especially the coastal regions of Mexico. First of all, the State of Veracruz experienced a series of intense rainfalls and as consequences of these events over 780 landslides were registered. More than 45000 people suffered from evacuations.

Located on the coast of the Gulf of Mexico, Veracruz has a wide range of altitude differences. The area with the highest elevations reaches from 5675 m.a.s.l. (Pico de Orizaba, the highest mountain of Mexico) to approximately 3000 m.a.s.l. and is characterized by steep slopes and V-shaped valleys. The mountains are part of the Sierra Madre Oriental and the Trans-Mexican Volcanic Belt. Plateaus and rounded hills are typical for the intermediate zones (3000 - 500 m.a.s.l.). The lowest zone (from 500 m.a.s.l. to sea level) is defined by moderate slopes, large rivers and coastal plain areas.

The geology shows a variety and complexity of sedimentary and volcanic rocks. The sedimentary formations comprise claystones, siltstones, sandstones and calcareous rocks. Plateaus of basalts and andesites and deposits of ignimbrites are representative for this area.

Even though Veracruz is a region highly endangered by landslides, currently there are no susceptibility maps or any other relevant information with high spatial resolution. Because of the lack of high definite information about the landslide hazards in this area, detailed investigations about the conditions (geology, geomorphology, thresholds, etc.) are indispensable.

A doctoral grant from the German Academic Exchange Service (DAAD) allowed to carry out investigations in areas affected by large landslides in the year 2013. The selected study sites comprise damaged infrastructures and settlements.

With a multi-methodological and interdisciplinary approach different processes and types of mass movements are analyzed in order to reconstruct complex interrelations of the causes and effects of landslide events. One of the major objectives of this research is to evaluate the potential hazard of active landslide areas.

Detailed field analyzes were performed to investigate the situations and dynamics of the slope movements. Therefore, geomorphological mapping, sediment characterization as well as geophysical methods are applied. On the one hand, a detailed sediment characterization aims to identify the type of material (e.g. geotechnical attributes), on the other sediments can provide information on different activity phases, respectively movement processes in slide masses. Furthermore, the focus is placed on the determination of landslide relevant parameters and thresholds.

Digital elevation models, which were generated before the onset of slope movements, are integrated in the geomorphological analysis.

The poster presents the specific study sites in Veracruz and the situation of endangered slopes before and after the landslide events. It is planned to use this knowledge to model susceptibility maps for the region in the future. Moreover, field data will be used as basic information for further monitoring plans.

Resulting susceptibility maps will be provided to the responsible authorities in order to support sustainable planning of settlements and infrastructure in hazardous regions.