Geophysical Research Abstracts
Vol. 18, EGU2016-13796, 2016
EGU General Assembly 2016

Morphological changes at Colima volcano caused the 2015 Hurricane Patricia investigated by repeated drone surveys and time lapse cameras

Thomas R. Walter (1), Carlos Navarro (2), Raul Arambula (2), Jackie Salzer (1), and Gabriel Reyes (2)
(1) GFZ Potsdam, 2.1, Potsdam, Germany (twalter@gfz-potsdam.de), (2) Universidad de Colima, Mexico

Colima is one of the most active volcanoes in Latin America, with frequent dome building eruptions and pyroclastic flow hazards. In July 2015 Colima had a new climax of eruptive activity, profoundly changing the summit morphology and redistributing volcanic ashes to the lower volcano apron. These unconsolidated ashes are prone to be mobilized by rainfall events, and therefore required close monitoring. A major hurricane then had landfall in western Mexico in October 2015, accumulating c. 450 mm of rainfall at a meteorological station at Nevado de Colima (3461 m) and immense lahar and ash deposit mobilization from Colima Volcano. Hurricane Patricia was the largest ever recorded category 5 storm, directly crossing the state of Colima. Due to the successful scientific advice and civil protection no human losses were directly associated to this lahar hazards.
We have conducted drone overflight in profound valleys that directed the pyroclastic flows and lahars two days before and three days after the hurricane. Over 8,000 close range aerial photographs could be recorded, along with GPS locations of ground stations. Images were processed using the structure from motion methodology, and digital elevation models compared. Erosion locally exceeded 10 m vertically and caused significant landscape change. Mass mobilization unloaded the young pyroclastic deposits and led to significant underground heat loss and water boiling in the affected areas. We also firstly report the use of camera array set-ups along the same valley to monitor lahar deposition and erosion from different perspectives. Combining these photos using photogrammetric techniques allow time series of digital elevation change studies at the deepening erosional ravines, with large potential for future geomorphic monitoring. This study shows that photo monitoring is very useful for studying the link of volcano landscape evolution and hydrometerological extremes and for rapid assessment of indirect volcanic hazards.