Geophysical Research Abstracts
Vol. 20, EGU2018-11465, 2018
EGU General Assembly 2018

Quantifying deforestation effects on rainfall induced shallow landslides and debris flows pathways

Jonas von Ruette, Peter Lehmann, and Dani Or
ETH Zurich, Soil and Terrestrial Environmental Physics, Zurich, Switzerland (peter.lehmann@env.ethz.ch)

Landslides and subsequent debris-flows initiated by rainfall represent a common natural hazard in mountainous regions. The exposure of human activity expansion into such regions is exacerbated by conflicting land use functions such as deforestation that may increase the risk of abrupt mass release. We applied a modeling framework (STEP-TRAMM) that links threshold mechanical model with hydrology and land cover to systematically evaluate the impact of land use change (deforestation) on occurrence and patterns of landslides in various catchments in the world. We have used high resolution global soil (1 km), DEM and precipitation databases and global forest change database. By combining deforestation maps with Google Earth imagery, we selected regions with well-defined deforestation events and clear signatures of mass release. We simulated effects of most intense rainfall events after deforestation and compared simulated and observed landslide patterns to quantify potential effects of deforestation. Simulations were run for the same catchment before and after deforestation to compare landslide characteristics. Results from four catchments studied (New Zealand, Oregon, Cambodia, and Sumatra) have shown that deforestation resulted in a doubling of landslide numbers (individual events) and soil volumes released after deforestation. The effect of deforestation was highly sensitive to the size and elevation of the deforested patches.