

## MSc Thesis: Suicidal forests? – Modeling biomass surcharge as potential landslide drivers

Shallow landslides are an important erosion process in forests. Aside from soil, they mobilize living and dead biomass, thus coupling the C fluxes and impacting the carbon balance of forests directly by transferring biomass from the living to the CWD pool, reworking those pools and consequently altering local carbon stocks on the landscape. In forests, trees are the control on erosion. Forests help impeding soil erosion by reducing rain splash via canopy and leaf-litter interception, and reinforce slope stability through root anchoring. Yet cause and effect are not always that unidirectional and disentangling the biotic role remains ambiguous. For example, the weight of forest and vegetation mats may culminate in sliding. At the same time, landslide scars provide new open spots for vegetation succession, and consequently landsliding control biomass stocks on thus denuded hillslopes. Forest biomass imposes load, though soil exceeds biomass loads above a potential failure planes in most cases. The effect of biomass overburden on hillslope stability should be limited to steep, shallow soil mantled slopes close to failure. Then biomass loads push hillslopes towards instability. Assuming landslide triggers ('disturbances'), such as earthquake shaking or rainfall, forests may, thus, become "suicidal". The step to generalization, i.e. physics-based modelling of critical biomass burden vs. landslide exposure is completely unexplored. To this end, quantifying biomass, but even more to simulating vegetation dynamics over several disturbance recurrence intervals is required.

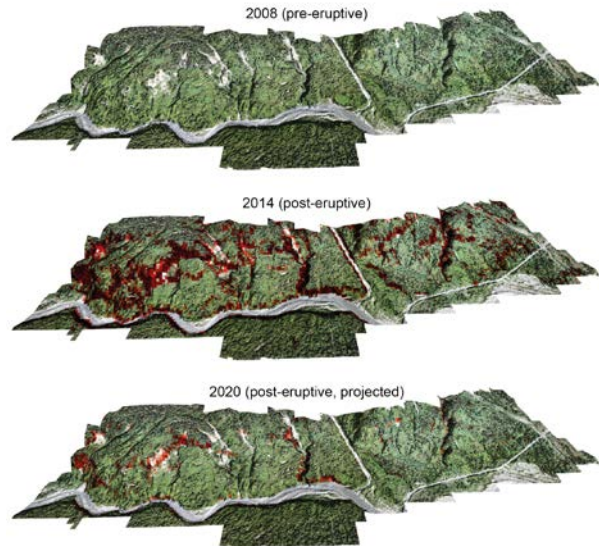


Figure 1. Landlab-modeled landslide exposure in red (U-1) for a hillslope of Chaitén volcano (Figure 5) using pre-landslide TanDEM data (12m x 12m) draped over UAV-derived post-landslide orthophoto (03/2018). Parameterization comes from the literature<sup>10</sup>.

This MSc-project simulates vegetation dynamics – landslide feedbacks in one of the biomass-richest forest biomes worldwide, the Patagonian rainforests. To this end, available Landlab components of vegetation dynamics, soil evolution, soil moisture will be coupled to test for forest-specific thresholds of biomass accumulation for landslide initiation over several characteristic disturbance recurrence intervals. Beside interest in ecogeomorphic work, strong skills in programming, the willingness to learn Landlab and particularly Python is required. Interested?

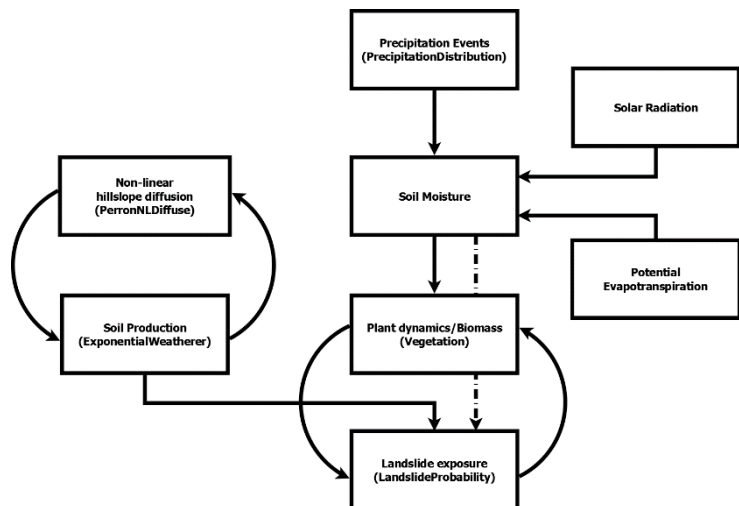


Figure 2. Conceptualized modeling strategy.

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