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Physically-Based Shallow Landslide Susceptibility Mapping, NW of Portugal

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Two physically-based models **-** *Shallow Landslide Stability Analysis* (SHALSTAB) and *Safety Factor* (SF) – are applied in Serra da Peneda (northwest of Portugal) to evaluate shallow landslide susceptibility in Tibo drainage basin. This small basin is located in an area of granitic and metasedimentary substrate, covered by different types of surficial formations (weathering mantles and slope deposits).

The application of the selected models requires the determination of a set of mechanical and hydrological parameters, and the use of high resolution topographic information to create an accurate DTM. To fulfill this goal we have applied the *Shallow Landslide Stability Analysis* (SHALSTAB) and the *SF* (Safety Factor) models.

The shallow landslide area was inventoried on the field. The cohesion was assessed by back analysis and the other mechanical and hydrological soil parameters were assessed on the field survey. Several susceptibility scenarios were tested with SHALSTAB model.

The best SHALSTAB scenario used to assess the susceptibility is achieved using the following parameters: cohesion (c) = 2000 N/m^2, soil thickness (z) = 1,2 m, internal friction (ϕ)=32^o and soil weight (ρ_s)=14,7 KN/m^3.

Shallow landslide susceptibility mapping using the SF model, was based on the cartography of the factors registered on the field survey and used the following parameters: cohesion (c) = 2000 – 6000 N/m^2, soil thickness (z) =1,2 m, internal friction (ϕ)=30 - 40^o; soil volumic weight (γ_m) = 13,7 – 15,7 KN/m^3 and Hydraulic conductivity = 0 – 3,9-03 kfs.

SHALSTAB scenarios were validated by overlaying the shallow landslide area (scar concentration) and selected the better susceptibility modeling.

The parameters used on the SF model applied spatially variable values registered in the field survey (using the superficial formation cartography). To validate the SF model we used the AUC (Area Under the Curve) method.

The two models were compared by the scar concentration and landslide potential.

There are no great differences between the instability modeling generated by both models, although SHALSTAB scenario has showed better results. The hydrologic model used by SHALSTAB presents an important improvement to the susceptibility assessment and seems to be the main reason for the better performance of the SHALSTAB model.

Keywords: *Shallow Landslides susceptibility; physically-based models; field monitoring; SHALSTAB; SF*