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## Exploiting EGMS data in a thickness inversion methodology to enhance shallow landslide assessment

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Physically-based models for rainfall-triggered landslides enhance understanding of the interactions between rainfall, soil hydrology, and slope stability. Pre-event landslide modeling presents significant challenges, primarily due to uncertainties in estimating landslide volumes, which depend on the complex geometries of natural and basal sliding surfaces. Furthermore, physically-based distributed models often face challenges in acquiring datasets that are both spatially and temporally comprehensive.

This study introduces a methodology leveraging recent advancements in remote sensing technologies, which offer promising non-contact solutions for estimating landslide characteristics. A key focus is on calculating soil thickness, a critical parameter influencing mobilized soil weight and the factor of safety (FS) for physically based modeling. We integrate InSAR data from the European Ground Motion Service (EGMS), which provides freely accessible, continental-scale ground motion and displacement rate observations over stable targets (the so-called persistent scatterers, or PS), generally identified with man-made infrastructures or rock outcrops, with the mass conservation method. This method assumes minimal changes in the sliding base geometry during the observed deformation period, linking the rate of landslide thickness change to the spatial variation of the vertical deformation mean yearly velocity, enabling soil thickness estimation and sliding geometry definition. The experiment involved selecting landslides with a minimum number of PS falling on their surface, then setting up the system of differential linear equations applied to the selected PS targets. Tikhonov regularization was employed to overcome ill-posedness, and the equations were solved by finite difference methods implemented in Matlab. The Tikhonov regularization introduces a smoothing parameter which assigns a weight to the Laplacian term of the thickness model. The methodology is being tested in a case study area within the Friuli-Venezia Giulia region, in Italy, known for well-documented shallow landslides in

the Italian Landslide Inventory (IFFI).

Preliminary results demonstrate that the soil thickness and sliding geometry can be retrieved with reasonable accuracy, although measurements are highly sensitive to the choice of the smoothing parameter used in the regularization process.