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Overview of seismic imagery techniques applied to landslides characterization.

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From numerous studies, geophysical methods based on seismic surveying appear to be well-adapted to investigate the morpho-structure of landslides and to progress in understanding the related mechanisms. Indeed, these methods allow direct and non-intrusive measurements of acoustic (V_p) or shear (V_s) wave velocity, two important physical parameters for estimating mechanical properties of reworked moving materials. Different processing techniques and inversion strategies were applied on the La Valette and Super-Sauze mudslides (French South Alps) as well as on the Ballandaz landslide (Savoie, France) to retrieve these parameters. On each of these sites, measurements were recorded along 2D profiles of several hundred meters length, with sensor spacing from 2 to 5m. (of about few meters). A first approach, based on first breaks acoustic inversion for estimating V_p distribution on the Super-Sauze and La Valette sites was carried out; then, SASW (spectral analysis of surface waves) was performed to image V_s distribution on the same site. In order to produce a more geotechnical diagnosis of these sections, a fuzzy logic fusion was used to assimilate both of these parameters into a highest level of interpretation. This approach has (also) the advantage to take into account the resolution and accuracy of each individual method. Finally, a 2D elastic full-waveform inversion test was carried out on a synthetic seismic data set computed from a conceptual Super-Sauze velocity model. This test highlights the difficulty to manage highly contrasted media in terms of velocity but also of topography. Nevertheless, the integration in the inversion process of the whole seismic signal produce a more coherent model in terms of V_p and V_s distribution compared to above-cited conventional techniques.