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The analysis of landslide movement datasets using inverse velocity approaches

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In recent years a range of new remote sensing technologies have been developed that potentially allow the movement patterns of landslides to be determined with high precision and in near real-time. These include differential interferometry using satellite-based, airborne and surface-based synthetic aperture radar, and the use of high resolution laser scanning, usually using a ground-based or airborne emitter / sensor. In the latter case, highly accurate movement data can be achieved through DEM extraction. These tools are proving to be extremely powerful and effective mechanisms for collecting displacement data, and have a significant strength in that they measure movement of a large number of points across a landslide surface. However, they have one key limitation – they only provide information about the movement of the surface of a landslide, whereas in reality the system is a highly-complex, three-dimensional entity. A critical question is therefore to what degree surface displacement can be used to understand the overall behaviour of the landslide.

In this paper, we use archive landslide movement data to examine the relationship between surface expressions of movement and the processes / deformations occurring in the shear zone. We demonstrate that in most landslides there is a close correspondence between the basal deformation mechanisms and their surface expression. Furthermore, we propose a model that allows interpretation of basal deformation from surface measurements and which, under certain circumstances, allows prediction of likely future behaviour. In some cases surface movement data can even be used to predict the time of occurrence of a final, catastrophic, failure. This model provides a means by which the new remote sensing technologies can be deployed in order to understand and in-

terpret landslide behaviour, paving the way for a new level of landslide monitoring activities.