Movement of Hinteres Langtalkar rock glacier 2009 - 2013 by using the ICProx-algorithm at very high resolution point clouds from terrestrial laserscanning

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Beginning in 2000 terrestrial laserscanning has been carried out annually (except 2001-2003) at the front of the very active rock glacier Hinteres Langtalkar, Schober Mountains, Austria (HLC; N46°59′, E12°47′). From 2009 on the sensor Riegl LMS Z620 has been in use for data acquisition. The rock glacier Hinteres Langtalkar is characterised by a very active rock glacier front (up to 3.40 m a-1) which leads to massive problems in the comparison of the data sets and subsequent calculation of movement vectors. Surface based matching approaches like e.g. the iterative closest point (ICP) algorithm do not need reference points measured or extracted geometric planes. These approaches fail in applications where widespread deformations occur. To overcome this drawback the ICProx-algorithm is applied which identifies deformation by comparison of locally determined transformation vectors. Non moving areas are identified by conducting the maximum subset method (MSS). So the ICProx algorithm provides a new tool to match point clouds with large inherent deformation zones.

As we see in our analyses, the ICProx approach works very well at the test site Hinteres Langtalkar. In contrary to the conventional ICP approach – no matching was achieved due to too large deformation rates at the front area of the rock glacier – the ICProx showed satisfactory results in the matching the entire valley-head. Misalignments only occurred in areas with a very small incident and simultaneous large distances to the scanner.