Geophysical Research Abstracts
Vol. 18, EGU2016-11798-1, 2016
EGU General Assembly 2016

An effective methodology for integrating displacement and velocity data from different sources for rock glaciers monitoring

Marcello Petitta (1), Benni Thiebes (1), Giovanni Cuozzo (1), Mattia Callegari (1), Romy Schlögel (1), Giulia Chinellato (1), and Robert Kenner (2)

(1) EURAC, Institute for applied remote sensing, Bolzano, Italy (marcello.petitta@eurac.edu), (2) WSL Institute for Snow and Avalanche Research SLF, Davos, Switzerland

The monitoring of slope displacements is a necessary task for the management of natural hazards, and a wide array of methodologies, each with their inherent benefits and drawbacks, is available. GNSS measurements, for example, deliver high-accuracy results of positioning for single points but require researchers or technicians to go the field and take the measurements manually. Multi-temporal radar interferometry on the other hand can provide high-accuracy results for large areas; however, displacements are only measured along the line of sight of the satellite. At present, there is no generally accepted method for integrating and assimilating different data into single displacement products.
This problem was the starting point of the INTERREG funded research project SloMove in which rock glaciers and deep-seated landslides in Italy and Switzerland were monitored, and the resulting data subsequently assimilated. In our contribution, we focus on the monitoring and data integration results of three active rock glaciers located above the town of Pontresina, (Upper Engadine, Switzerland) for which extensive monitoring was carried out using differential GNSS, terrestrial long-range laserscanning and multi-temporal radar interferometry based on Cosmo SkyMed imagery. Data integration utilised an approach borrowed from atmospheric sciences, i.e. 3DVAR, a method that assimilates different data and minimises errors and uncertainties associated with each data set.
Results appear to be very promising; the methodology produces three-dimensional displacement fields for the study site, and the validation, performed while routinely excluding a GNSS measurement site from the computation of the background field, results in linear correlation coefficients between 0.75 and 0.86 and RMSEs in the order of 1mm. Based on our research, we conclude that the assimilation approach represents a clear methodology, largely experimented in other disciplines, which can be routinely used when different data sources are available and an integrative method is needed.
In our presentation, we will highlight the results of rock glacier monitoring and the subsequent data integration, and also share our experiences on applying the aforementioned methodologies in a high-alpine environment.