Geophysical Research Abstracts
Vol. 15, EGU2013-8822, 2013
EGU General Assembly 2013

Multitemporal airborne laser scanning for the analysis of glacier change in South-Tyrol (Italy)

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The mountain ranges in the area of the Autonomous Province of Bozen - South-Tyrol (Italy) contain numerous glaciers of various sizes and in different elevations and expositions. During the annual melt period, the runoff of these glaciers feeds the Etsch-river, which is the main water source for the extensive fruit production in the Vinschgau, an inner alpine dry valley with very low precipitation. Nevertheless, relatively little is still known about the current state of the glaciers in this area, except from the glacier inventories for 1983, 1997 and 2005/2006 and few glaciers which are subject to mass-balance studies.
The study area encompasses the glaciers within the main part of the Ortler-Cevedale group (Sulden and Martell valleys), which is the most heavily glaciated region in South-Tyrol, the glaciers of the upper Ulten valley and the glaciers of the Schnals valley at the alpine main ridge.
For this study, two sets of airborne laser scanning (ALS) data are used to calculate the recent changes in glacier area and volume. ALS data from 2005 is available from the Autonomous Province of Bozen, while another data acquisition campaign was conducted in context of the project MALS (Multitemporal Airborne Laserscanning South-Tyrol) in autumn 2011. The extents of all glaciers in the study areas have been delineated for both dates, based on digital terrain models (DTM), hillshades and intensity information. Those results are used to calculate changes in the glaciated areas.
The geodetic mass balance for al studied glaciers is calculated as well. Therefore, changes in glacier volume between 2005 and 2011 and their altitudinal distribution are calculated from the differences of the ALS-based DTM.
The results of the mass-balance calculations for the single glaciers are interpreted with respect to their spatial distribution, taking topographic parameters such as altitudinal distribution of glacier area, slope into account.