Geophysical Research Abstracts
Vol. 21, EGU2019-8363, 2019
EGU General Assembly 2019

Measuring mountainous snowpack thickness with Pléiades high resolution stereo-images

César Deschamps-Berger (1), Simon Gascoin (1), Etienne Berthier (2), Marie Dumont (3), Ethan Gutmann (4), and Jeffrey Deems (5)

(1) CESBIO, Toulouse cedex 9, France (cesar.db@hotmail.fr), (2) LEGOS, Toulouse, France, (3) CNRM-GAME, CEN, Grenoble, France , (4) NCAR, Boulder, USA, (5) NSIDC, Boulder, USA

Measuring snowpack volume over extended area in mountainous area relies nowadays on demanding field survey (snow course, terrestrial laser scan) or costly airborne campaign. In this study we evaluate the precision of photogrammetry from high resolution (0.5 m) satellite optical images for mapping snow height in mountains. The snow height maps result from the difference between a snow-covered Digital Elevation Model (DEM) and a snow-free DEM. We derive snow height maps from Pléiades satellite stereo images and compare it to the Airborne Snow Observatory products over the Sierra Nevada (USA). We evaluate the sensitivity of our products quality to i) the calculation of the DEMs (photogrammetric processing) and ii) the co-registration of the DEMs. Over snow covered area, the standard deviation of the residual between the ASO and our product is 1 m but shows a bias inferior to 0.1 m. Snow height gradient along elevation is very similar with both methods. We suggest that formal error of snow height maps should be primarily evaluated against the slope of the terrain and that a lower boundary systematic error can never be completely ruled out. We conclude that photogrammetry from satellite images is a promising approach for measuring snow height in remote mountain areas.