



Climate data records of glacier zones and late summer snow areas on glaciers from Landsat and Sentinel-2

Gabriele Schwaizer, Johanna Nemec, Thomas Nagler, and Helmut Rott
ENVEO IT GmbH, Innsbruck, Austria (gabriele.schwaizer@enveo.at)

Observations of glaciers as sensitive indicators for climate change started already years ago. While a lot of effort was put in the last years into the mapping of glacier areas and changes of these, observations of changing glacier surface conditions and the changes in the accumulation and ablation areas on glaciers were only available for single glaciers or small glacier regions, mainly where in-situ observations of glacier mass balances are available. Within a recently completed option on glacier zones and late summer snow areas on glaciers of the ESA glaciers_cci project, we developed, implemented, verified and applied methods for automated classification of snow areas on glaciers remaining at the end of the ablation season and of glacier facies from high resolution optical satellite data. We used multi-annual late summer acquisitions of the Landsat satellites since mid of 1980s and of the Copernicus Sentinel-2 satellites since 2015 to generate climate data records of late summer snow areas on glaciers and glacier zones in glacier regions in Europe, Alaska, South Asia and Patagonia. Late summer snow areas can be used as proxies for accumulation areas on glaciers. Based on the generated climate data record of late summer snow areas on glaciers, changes in a glacier's accumulation area ratio, which is often used as measure of a glacier's mass balance, can be assessed. The multi-annual observation of glacier facies allows additionally the identification of changing debris cover or the occurrence of firn areas on glaciers and can support the assessment and understanding of changes in glacier mass balances for single glaciers and large glaciated areas worldwide. We will present examples of multi-annual late summer snow areas and glacier facies for selected glaciers and show analyses of the generated climate data records from mid of 1980s until present on glacier regions in different climate zones.