



Validation of operational AVHRR sub-pixel snow cover maps for the European Alps

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The European Alps with their complex topography have a strong spatial variation of the snow cover with small patches of snow on a heterogeneous land cover. Due to the medium spatial resolution of the NOAA AVHRR sensor of 1.1 km² at nadir, each pixel potentially represents a mixture of snow, cloud, forest, rock etc. Classification of such mixed pixels can lead to errors, which renders the area estimation inaccurate. In this paper we present a method and a first validation of a fast and simple solution for the operational retrieval of snow covered area using NOAA AVHRR data. Linear spectral mixture modelling is used to estimate snow cover at sub-pixel resolution. Principal component analysis (PCA), including the visible and near-infrared channels of the AVHRR and a multiple combination of pure-element reflections is created to take into consideration the inherent variability of an image pixel more effectively.

Sub-pixel snow cover maps are generated from the year 2003 and 2004 and compared with in situ surface parameters from snow stations in the Swiss Alps. The performance of the algorithm over different seasons is determined to validate the method under variable conditions. Additionally, ASTER data have been used as "ground truth" and the snow cover percentage was calculated for the AVHRR grid cell.

The overall results indicate that the sub-pixel procedure identifies reasonable snow cover fractions in the Alps. The evaluation of short-time snow accumulation and snow ablation periods shows a good agreement with the dynamic behaviour of the snow cover.