



Potential and Limits of temporally and spatially calibrated NDSI snow cover maps

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The Normalised-Difference Snow Index (NDSI) was formulated by Dozier in 1989 for Landsat data and is still the most frequently used relationship to derive satellite snow cover maps as it is simple and effective. Though, our recent study presenting the Photo Rectification And Classification Software (PRACTISE v2.1, 2016) highlighted that the determination of the NDSI threshold value is critical for optimum results. We therefore developed a new and objective method to automatically calibrate the NDSI threshold value in a satellite image by making use of terrestrial photographs as in situ information. A first case study for Landsat scenes in the alpine Zugspitzplatt catchment at the German-Austrian border demonstrated that the calibrated NDSI threshold values vary temporally but are representative for the surrounding alpine area of several square kilometers at the specific date. Furthermore, it was shown that the application of these optimized NDSI threshold values instead of the generally used value from literature leads to significant changes in the NDSI snow cover maps. The study mentioned, however, did neither investigate long-term temporal NDSI threshold variability nor the representativeness of the NDSI threshold on the regional scale. Both topics are now addressed by processing the complete time series at the Zugspitzplatt and by including a second alpine and long-term observation site, the Vernagtferner area in Austria. The analysis of the two long-term time series located within the same Landsat scene is thus utilized to investigate and understand the spatially and temporally distributed NDSI threshold variability, as well as to define the potential and limits of the complementary use of terrestrial photographs and satellite images to derive optimum snow cover maps.