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Analysis of MODIS snow cover time series over the alpine regions as input for hydrological modeling

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Snow extent and relative physical properties are key parameters in hydrology, weather forecast and hazard warning as well as in climatological models. Satellite sensors offer a unique advantage in monitoring snow cover due to their temporal and spatial synoptic view. The Moderate Resolution Imaging Spectrometer (MODIS) from NASA is especially useful for this purpose due to its high frequency. However, in order to evaluate the role of snow on the water cycle of a catchment such as runoff generation due to snowmelt, remote sensing data need to be assimilated in hydrological models.

This study presents a comparison on a multi-temporal basis between snow cover data derived from (1) MODIS images, (2) LANDSAT images, and (3) predictions by the hydrological model GEOtop [1,3]. The test area is located in the catchment of the Matscher Valley (South Tyrol, Northern Italy).

The snow cover maps derived from MODIS-images are obtained using a newly developed algorithm taking into account the specific requirements of mountain regions with a focus on the Alps [2]. This algorithm requires the standard MODIS-products MOD09 and MOD02 as input data and generates snow cover maps at a spatial resolution of 250 m. The final output is a combination of MODIS AQUA and MODIS TERRA snow cover maps, thus reducing the presence of cloudy pixels and no-data-values due to topography. By using these maps, daily time series starting from the winter season (November – May) 2002 till 2008/2009 have been created.
Along with snow maps from MODIS images, also some snow cover maps derived from LANDSAT images have been used. Due to their high resolution (< 30 m) they have been considered as an evaluation tool. The snow cover maps are then compared with the hydrological GEOtop model outputs.
The main objectives of this work are:
1. Evaluation of the MODIS snow cover algorithm using LANDSAT data
2. Investigation of snow cover, and snow cover duration for the area of interest for South Tyrol
3. Derivation and interpretation of the snow line for the seven winter seasons
4. An evaluation of the model outputs in order to determine the situations in which the remotely sensed data can be used to improve the model prediction of snow coverage and related variables

References

[1] Rigon R., Bertoldi G. and Over T.M. 2006. GEOtop: A Distributed Hydrological Model with Coupled Water and Energy Budgets, Journal of Hydrometeorology, 7: 371-388.
[2] Rastner P., Irsara L., Schellenberger T., Della Chiesa S., Bertoldi G., Endrizzi S., Notarnicola C., Steurer C., Zebisch M. 2009. Monitoraggio del manto nevoso in aree alpine con dati MODIS multi-temporali e modelli idrologici, 13th ASITA National Conference, 1-4.12.2009, Bari, Italy.
[3] Zanotti F., Endrizzi S., Bertoldi G. and Rigon R. 2004. The GEOtop snow module. Hydrological Processes, 18: 3667–3679. DOI:10.1002/hyp.5794.