Towards a Consistent Pan-European Long-Term Snow Extent Product Derived From Historical AVHRR Data

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Snow extent (SE) has been classified a fundamental indicator of climate variability and change: The importance of comprehensive (long-term) snow monitoring for climate research is undoubted. Complementary to ground-based data and model approaches, satellite imagery provides comprehensive snow information, even in remote and inaccessible areas. Concerning the length of record, only AVHRR offers the opportunity to analyze more than 25 years of medium-resolution satellite imagery on a daily basis. Yet, this sensor offers a great opportunity to assess long-term environmental changes on a hemispheric to global scale but requires robust snow retrieval and a systematic assessment of the data set's long-term consistency and stability to avoid sensor-induced artefacts.

This study addresses the need to compile a consistent set of daily pan-european satellite snow cover composites for further application: We present first results from ongoing efforts in working towards a new 1-km AVHRR SE record covering Europe and dating back to the nineteen eighties. Taking into account the distinct spectral properties of the various AVHRR sensors, the snow detection relies on a threshold approach that exploits the spectral properties of snow in the visible and the near infrared spectrum. A major asset in comparison to most other AVHRR snow detection schemes is that this detection algorithm is applicable to any kind of AVHRR sensor generation with consistent results, which only then allows for retrieval of unbiased climate related information. The product consists of daily SE charts over Europe at 1-km resolution combining the data from various overpasses of AVHRR payloaded platforms into a maximum composite with minimum cloud coverage. Furthermore, a set of daily cloud-minimized snow products is provided by applying spatial and temporal gap-filling techniques. Consequently, this allows for the pan-european retrieval of various important parameters such as snow onset day, snow cover duration, melt-out date and the snow cover area percentage to analyze the spatiotemporal snow cover variability over the last three decades. A landcover-dependent validation of the record as well as an intercomparison to other European SE products is currently ongoing. Likewise, the temporal consistency and inter-sensor stability of the algorithm will be assessed on the expanded data set.