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Developing a cloud mask climatology covering two Meteosat satellite generations

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Long term cloud cover observations from satellites are fundamental for climate model validation and climate monitoring. Further, they support ground-based observations in regions with sparse coverage. Additionally, information on cloud cover is needed to derive other physical parameters such as surface radiation fluxes or clear sky and cloudy atmospheric states and is of high relevance for the solar energy sector. Within the current project phase of the Satellite Application Facility on Climate Monitoring (CM SAF) an algorithm to calculate a climatological cloud mask (or cloud cover probability) from Meteosat satellites is developed. The algorithm shall be applicable for both Meteosat first generation (1983-2005) and Meteosat second generation (2004-present) which significantly differ in their spectral properties.
The algorithm linearly aggregates a set of continuous scores instead of the commonly used decision tree approach. The scores are calculated for different channels as well as different spatial and temporal settings. Each score yields a probability for the pixel's cloud cover. The final result, the cloud cover probability, is obtained by combining all available scores taking into account the varying performance of the scores during day and night and over snow. The uncertainty of the final cloud cover estimate is an inherent part of the probability.
The algorithm is calibrated using cloud cover measurements from SYNOP stations located on the Meteosat disc. The subsequent validation is done at an independent set of collocated SYNOP/ARSA (Automated Radiosonde Archive) stations.
The presentation introduces the applied cloud mask algorithm and presents the results of the validation for both satellite generations. The comparison of the two satellite generations addresses the climatological homogeneity of the future cloud mask climate data record which will be distributed by CM SAF after 2016. Special attention is also drawn to issues like the day-night-bias of the cloud mask caused by different available channels during day (visible and infrared) and night (only infrared). This information is especially valuable for downstream application such as the derivation of land surface temperature or free tropospheric humidity.