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A robust threshold-based cloud mask for METEOSAT SEVIRI's High Resolution Visible Channel

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The effect of clouds on radiative fluxes depends on cloud type and can vary strongly both in space and time. Geostationary satellite imagers such as METEOSAT SEVIRI are able to monitor the temporal development of clouds, and to fully resolve their diurnal cycle. The spatial resolution of SEVIRI's narrowband channels (3x3 km2) however lags behind that of polar orbiting imagers such as MODIS (1x1 down to 0.25x0.25 km2). SEVIRI does have a high resolution visible channel (HRV) with a nadir resolution of 1x1 km2. We have developed a threshold-based cloud mask based on the HRV channel to separate cloudy and clear sky pixels, as a first step towards studying small-scale cloud structures with this channel. This mask is based on the operational cloud mask provided by EUMETSAT for SEVIRI′s low resolution channels, and aims for consistency with its results.
In this talk the algorithms underlying this HRV cloud mask are introduced. Focus is put on the approach used for the selection of suitable thresholds. Additionally, we find that it is of advantage to apply thresholds relative to a clear-sky reflectance climatology, and to adapt the threshold regionally. Furthermore, the accuracy of the different spectral channels for thresholding, and the suitability of the HRV channel for cloud detection are investigated. For fully overcast and clear pixels, respectively, we find a fraction of close to 0% and 10% of misclassifications relative to the EUMETSAT cloud mask. This indicates that cloudy pixels identified by our mask are reliable, while clear-sky pixels can contain undetected clouds. Overall, 27% of cloudy low-resolution SEVIRI pixels are found to be broken in our test dataset. Most of these broken pixels are classified as cloudy by EUMETSAT's cloud mask, which will likely result in an overestimate of cloud fraction.