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Optimal Exploitation of the Temporal and Spatial Resolution of SEVIRI for the Nowcasting of Clouds

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An algorithm was developed to forecast the development of water and ice clouds for the successive 5-120 minutes separately using satellite data from SEVIRI (Spinning Enhanced Visible and Infrared Imager) aboard Meteosat Second Generation (MSG). In order to derive cloud cover, optical thickness and cloud top height of high ice clouds "The Cirrus Optical properties derived from CALIOP and SEVIRI during day and night" (COCS, Kox et al. [2014]) algorithm is applied. For the determination of the liquid water clouds the APICS ("Algorithm for the Physical Investigation of Clouds with SEVIRI", Bugliaro e al. [2011]) cloud algorithm is used, which provides cloud cover, optical thickness and effective radius. The forecast rests upon an optical flow method determining a motion vector field from two satellite images [Zinner et al., 2008.]
With the aim of determining the ideal time separation of the satellite images that are used for the determination of the cloud motion vector field for every forecast horizon time the potential of the better temporal resolution of the Meteosat Rapid Scan Service (5 instead of 15 minutes repetition rate) has been investigated. Therefore for the period from March to June 2013 forecasts up to 4 hours in time steps of 5 min based on images separated by a time interval of 5 min, 10 min, 15 min, 30 min have been created. The results show that Rapid Scan data produces a small reduction of errors for a forecast horizon up to 30 minutes. For the following time steps forecasts generated with a time interval of 15 min should be used and for forecasts up to several hours computations with a time interval of 30 min provide the best results.
For a better spatial resolution the HRV channel (High Resolution Visible, 1km instead of 3km maximum spatial resolution at the subsatellite point) has been integrated into the forecast. To detect clouds the difference of the measured albedo from SEVIRI and the clear-sky albedo provided by MODIS has been used and additionally the temporal development of this quantity. A pre-requisite for this work was an adjustment of the geolocation accuracy for MSG and MODIS by shifting the MODIS data and quantifying the correlation between both data sets.