Geophysical Research Abstracts
Vol. 13, EGU2011-3367, 2011
EGU General Assembly 2011

Triple-collocation of precipitation retrievals from SEVIRI with gridded rain gauge data and weather radar observations over Europe

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We present comparisons of precipitation occurrence and intensity retrievals of the Precipitation Properties (PP-VNIR) algorithm against weather radar and gridded rain-gauge data. We use triple-collocation, a powerful tool to quantify error structures, to estimate the root mean square error in a set of three collocated, but independent, datasets. Moreover, the weather radar observations and PP-VNIR retrievals are used to evaluate the diurnal cycle of precipitation in more detail.

Roebeling and Holleman (2009) presented a novel method to calculate precipitation occurrence and intensity using information on cloud physical properties retrieved from visible and near-infrared observations. The Spinning Enhanced Visible and Infrared Imager (SEVIRI) is the first satellite instrument with the potential to provide these precipitation properties from a single instrument at a sampling frequency of 15 minutes. To determine the validity of the PP-VNIR retrievals we apply a triple-collocation statistical model to retrievals over Europe during three summer periods. The PP-VNIR retrievals are obtained from SEVIRI, the weather radar data are obtained from the common European integrated weather radar system, while the gridded rain gauge observations are obtained from the Global Precipitation Climatology Centre (GPCC) and/or the European Climate Assessment and Data set (ECA&D). The spatial and seasonal dependence of the respective errors are analysed and discussed. We also evaluate the diurnal cycles of precipitation occurrence and intensity as retrieved from PP-VNIR and observed by weather radar.

The results suggest that the triple-collocation method provides realistic error estimates. Spatially, the gridded rain-gauge datasets agree very well with the PP-VNIR retrievals, while they agree weakly with the weather radar observations. It is discussed that part of these differences are caused by the fact that the weather radar products are based on different radars and algorithms, whereas the PP-VNIR retrievals have the advantage to be based on a single instrument. Since observations from a single weather radar can be used to determine temporal variations in precipitation it is concluded that these observations are best suited for studying the diurnal or seasonal variations at a local scale. It will be shown that the diurnal cycles of precipitation retrievals from PP-VNIR agree well with those observed from weather radar for the different climate regimes of Europe during daylight hours. The results obtained in this study can help us in developing adequate strategies for the combined use of various precipitation datasets, for example for improved monitoring of diurnal variations in precipitation or for detecting temporal trends in precipitation.