Separation of convective and stratiform precipitation for an analysis of the local model by using meteosat data

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An improved independent precipitation data set with the horizontal resolution of the 7km LM grid over central Europe was generated. For scale dependent evaluation of the local model, the data were separated into convective and stratiform precipitation fractions. For this purpose we used the data set of “present weather” (ww), rain gauges, and cloud types from the WMO–network in hourly resolution from the year 1995 until 2004 together with cloud types derived from Meteosat data. Meteosat data with a temporal resolution of 30 minutes are archived from 1992 until now at the Free University Berlin (FUB) together with the derived products of cloud cover and cloud classes. For the compilation of the independent precipitation dataset (FUB-analysis), the Meteosat data were mapped to the resolution of the LM grid. For the selected cloud classes, the mean precipitation rates are calculated through a statistically analysis. The interpolation scheme for our precipitation analyses is a simple linear equation by an interpolation scheme with the weighting function of cloud classes from Meteosat which is determined by the distance between gridpoint and each observation. To introduce an anisotropic conditions, the satellite born weights for precipitation are used at the gridpoint from satellite cloud classes/types and at observation sites from observed or from satellite cloud classes/types.

Due to the responsibility of cloud types for convective and stratiform precipitation, different combinations of into cloud classes were used for our precipitation analyses. The cloud classes for convective and stratiform rainfall are as follows: the cumulus class contains the cloud types cumulus mediocris, cumulus congestus and ’cumulus and stratocumulus’, the cumulonimbus class consists of cumulonimbus calvus and cumulonimbus capillatus, the stratus class contains stratocumulus, stratus nebulosus, stratus fractus and ’cumulus and stratocumulus’, the nimbostratus class contains altostratus opacus or nimbostratus, altocumulus translucidus or altocumulus together with altostratus or nimbostratus. The "cumulus and stratocumulus" cloud type (WMO–type 8 of low clouds) is separated into convective and stratiform cases by evaluating the “present weather” (ww) information. Statistical analysis revealed that the weighting factor of this cloud type is associated with stratiform precipitation with 67% and with 33\% for convective precipitation. For the selected cloud classes, the mean precipitation rates are calculated through a statistically analysis.

Shown is an example for 3—hourly precipitation from 12 August 2002 at 13 UTC, with the weights for precipitation from satellite and an example of an interpolation precipitation analysis. The weighted analysis shows more detailed structures, especially in the representation of the extreme values. Depending on the actual observations an anisotropic correction is possible. The next step will be the utilization of the weights from AMSU/MSG data within optimum univariate scheme and an adjustment by measurements of daily sums of precipitation in small spatial grid resolution of 2.8 km.