Geophysical Research Abstracts, Vol. 9, 09009, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-09009

Statistical precipitation estimation from SEVIRI data and validation procedures by using U.K. weather radar

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A statistical based algorithm is proposed here to exploit at best the SEVIRI channels on board METEOSAT-8 satellite. A relevant issue linked to the estimation precipitation algorithms is the way to express the performance that they can provide when used into operational system. This is directly related to the verification (or validation) problem that also will be discussed in this work.

As the relationship between satellite VIS/NIR/IR measurements and the surface precipitation is rather weak, it is convenient to adopt a statistical approach and to restrict the estimation to a relatively small number of rain-rate classes. The precipitation classes here considered are: [less than 1/32] mm/h, [1/32, 0.125] mm/h, [0.125, 0.5] mm/h, [0.5, 2.0] mm/h, [more than 2.0]. The algorithm to classify SEVIRI satellite pixels into those classes of precipitation is based on Artificial Neural Networks (ANNs).

The data set used here consists of 90 cases around noon time and for June, July and August 2004. Radar precipitation estimation, provided by the U.K. MetOffice Nowacasting Nimrod system, are used to calibrate and validate the satellite-ANN based algorithm.

The validation procedure is carried out by considering an half part of the available data set that is independent from the half one used during the calibration (or training) phase. In this phase, by comparing radar precipitation map and satellite precipitation estimation, several skill indicators are computed: correlation coefficient, Heidke Skill Score, Equitable Threat Score and BIAS. The dependence of the above skill indicators from the rain-rate distribution into classes of precipitation is shown and discussed. The validation procedure is therefore carried out by taking into account that fact and the best way to indicate an algorithm expected performance is then suggested.