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Verification of precipitation forecasts over the Mediterranean with satellite observations

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Mesoscale models offer an ideal framework for performing detailed and explicit simulations of cloud and precipitation. First, these models are able to follow the time evolution of different moments of the hydrometeors distributions in the context of real meteorological conditions. Second, the grid mesh of a mesoscale model is of the same size as a satellite pixel, facilitating a comparison without it being necessary to resort to additional assumptions on size. Here we adopt a model-to-satellite approach, in which satellite brightness temperature (BT) images are directly compared to BTs computed from predicted model fields. The approach is especially powerful in identifying discrepancies of cloud cover forecasts with BTs at 10.8 μm. The model-to-satellite approach associated with the BT difference (BTD) technique can also verify specific forecasts such as cirrus cover, dust occurrence, convective activity and overshoots.

An application of the approach to the French mesoscale model MESO-NH will be shown in the context of a Mediterranean heavy precipitation event that took place in November 2007 resulting in 400 mm of precipitation over the Cevennes, France. Several sets of 24 h MESO-NH simulations were constructed that differed in their initial and boundary conditions. Comparison with rain gauges showed that simulations initialized from large-scale operational analyses failed to capture the intensity of precipitation associated with convective events and overestimated the amount of precipitation when the conditions were not convective. In contrast, simulations starting from the mesoscale analysis of the French operational mesoscale model ALADIN were more successful in forecasting the amount and location of the precipitation. Satellite observations revealed that this was due to a better prediction of the intensity of the surface wind over the sea during the stratiform regime and a more timely onset of convection over the sea related to a better prediction of the quantity of precipitable water. This study shows the benefits of using satellite observations to verify precipitation forecasts over the sea.