On re-initialization methods and spin-up periods effects on WRF precipitation diagnostics

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In the scope of regional climate downscaling, with special focus on precipitation in complex terrain, several methods of dynamical downscaling with frequent re-initializations are being tested. In a configuration of three nested domains centered on a mountainous region in north-central Portugal with a complex topography, the WRF-ARW model is applied to the rainy periods during the first half of 2012. The large-scale data that are downscaled are those of the ERA Interim reanalysis of the ECMWF. The tests are designed to answer two questions regarding frequent re-initializations. The first concerns the spin-up period needed by the model to produce realistic precipitation predictions; the second relates to the initial conditions of each re-initialization. For every downscaling period, several initial conditions were tested: (1) interpolation of the large scale data into the computational domain of the study area; (2) 4DVAR assimilation of data from the ds351.4 and ds461.0 datasets from the CISL research data archive; (3) the same as under (2) butwith the assimilation of observed rainfall data. For each of the initialization tests described above, three spin-up periods were tested: 6h, 12h and 18h. The results of the different simulations are compared mutually as well as with the data from a dense network of automatic rain gauges that was installed in the domain for that specific purpose. The advantages and disadvantages of each method will be discussed in detail.