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Evaluation of the atmospheric water vapor content in the regional climate model ALARO-0 using GNSS observations from EPN Repro2

Julie Berckmans (1,2), Roeland Van Malderen (1), Eric Pottiaux (3), and Rosa Pacione (4)

(1) Royal Meteorological Institute, Ukkel, Belgium (julie.berckmans@meteo.be), (2) Centre of Excellence PLECO (Plants and Ecosystems), Department of Biology, University of Antwerp, Belgium, (3) Royal Observatory of Belgium, Ukkel, Belgium, (4) e-GEOS S.p.A, ASI/CGS, Matera, Italy

The use of ground-based observations is suitable for the assessment of atmospheric water vapor in climate models. Global Navigation Satellite Systems (GNSS) provide information on the integrated water vapor (IWV), on a high temporal and spatial resolution. We used IWV observations at 100 European sites to evaluate the regional climate model ALARO coupled to the land surface model SURFEX, driven by the European Centre for Medium-Range Weather Forecasts (ECMWF) Interim Re-Analysis (ERA-Interim) data. The selected stations provide data for a minimum of 10 years, resulting from the second reprocessing campaign of EPN (EPN Repro2).
The yearly cycle of the IWV for the 18-year period from 1996 to 2014 reveals that the model simulates well the seasonal variation. Although the model overestimates IWV during winter and spring, it is consistent with the driving field of ERA-Interim. However, the results for summer demonstrate an underestimation of the modeled IWV and a larger standard deviation, which is not present in ERA-Interim. The spatial variability among the sites is high, and shows a latitudinal dependence with respect to the standard deviation. Overall, these findings are in agreement with the distribution of the cold and wet bias by the model in winter, and the cold and mixed dry and wet bias in summer.