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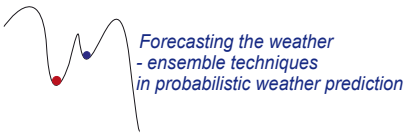

Multimodel SuperEnsemble downscaling techniques on Regional Climate Models in the Alpine area and wildfire potential evaluation in the scenario

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A set of Ensemble downscaling techniques is here tested and applied on a selection of the EU ENSEMBLES project Regional Climate Models (RCMs) outputs in the alpine area. These models show significant errors in the control period in areas of complex orography like the Alps, when compared with the observed climatology.
We evaluate the models versus the 25-km resolution E-OBS dataset from the ENSEMBLE project and a 14-km resolution dataset obtained with an Optimal Interpolation technique assimilating the daily ground station data in Piemonte (North-Western Italy), based on a background field obtained by a linear tri-dimensional downscaling of ERA-40 archive from 1957 to 2001 and of the ECMWF objective analysis from 2002 to 2009.
Hence, the outputs of the reanalyses (from ERA40) and scenarios (nested in several Global Circulation Model runs on the A1B SRES scenario) from the RMCs were interpolated from their original 25 km grids to the same grids of observed climatology and a set of different Ensemble techniques was applied.
The temperature reanalyses and scenarios obtained with Multimodel SuperEnsemble, in particular with the use of the high resolution analysis, allow a better characterization of the temperature variations in the alpine area, with differences between mountainous and plain regions.
Furthermore, we developed a new probabilistic Multimodel SuperEnsemble technique for the quantitative precipitation forecast, with a careful estimation of the Multimodel precipitation Probability Density Functions (PDFs) and prove here its promising results in the regional climatic model downscaling. We evaluate the observation PDFs conditioned to the RCMs reanalysis precipitation values and model them with appropriate distribution functions.
We then apply these PDFs to the model reanalyses and scenarios and weight them with weights obtained with the inverse of the Continuous Ranked Probability Score of each model in a training period. The precipitation fields so obtained show a reasonable agreement with the observed precipitation in the control period.
The humidity and wind speed fields are obtained with a simpler Poor-Man Ensemble trechnique on the model reanalyses, due to lack of observations for the whole control period, and we used all the so-obtained down-scaled variables to evaluate future scenarios of wildfire potential with the Canadian Fire Weather Index. The modelled fire indices agree surprisingly well with the observed forest fires and significant differences can be found in the Fire Weather Index skill versus the observed fires as a function of the altitude or the dominant weather regimes, thus confirming the value of such a technique for assessing the wildfire potential in the control period and allowing its use in the scenario evaluations.