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Assessment of multiple daily precipitation statistics in ERA-Interim driven Med- CORDEX and EURO-CORDEX experiments against high resolution observations

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We assess the statistics of different daily precipitation indices in ensembles of Med-CORDEX and EURO-CORDEX experiments at high resolution (grid spacing of $\sim$0.11°, or RCM11) and medium resolution (grid spacing of $\sim$0.44°, or RCM44) with regional climate models (RCMs) driven by the ERA-Interim reanalysis of observations for the period 1989-2008. The assessment is carried out by comparison with a set of high resolution observation datasets for 9 European subregions. The statistics analyzed include quantitative metrics for mean precipitation, daily precipitation Probability Density Functions (PDFs), daily precipitation intensity, frequency, 95th percentile and 95th percentile of dry spell length. We assess both an ensemble including all Med-CORDEX and EURO-CORDEX models and one including the Med-CORDEX models alone. For the All Models ensembles, the RCM11 one shows a remarkable performance in reproducing the spatial patterns and seasonal cycle of mean precipitation over all regions, with a consistent and marked improvement compared to the RCM44 ensemble and the ERA-Interim reanalysis. A good consistency with observations by the RCM11 ensemble (and a substantial improvement compared to RCM44 and ERA-Interim) is found also for the daily precipitation PDFs, mean intensity and, to a lesser extent, the 95th percentile.
In fact, for some regions the RCM11 ensemble overestimates the occurrence of very high intensity events while for one region the models underestimate the occurrence of the largest extremes. The RCM11 ensemble still shows a general tendency to underestimate the dry day frequency and 95th percentile of dry spell length over wetter regions, with only a marginal improvement compared to the lower resolution models. This indicates that the problem of the excessive production of low precipitation events found in many climate models persists also at relatively high resolutions, at least in wet climate regimes. Concerning the Med-CORDEX model ensembles we find that their performance is of similar quality as that of the all-models over the Mediterranean regions analyzed.
Finally, we stress the need of consistent and quality checked fine scale observation datasets for the assessment of RCMs run at increasingly high horizontal resolutions.