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Evaluation of simulated decadal variations over the Euro-Mediterranean region from ENSEMBLES to Med-CORDEX

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Med-CORDEX simulations over the period 1979-2011 are evaluated with regard to their capability to represent observed decadal variations over the Euro-Mediterranean region and improve upon previous generation simulations from the ENSEMBLES project in their various experimental set-ups. Such an evaluation is needed to inform the use of these simulations and also future model development.
For temperature, both Med-CORDEX and ENSEMBLES simulations tend to provide comparable results: they generally capture the sign and timing of the anomalies but not the amplitude. In general, no clear stratification appears when considering different types of Med-CORDEX regional modeling systems. Rather, it is remarkable that certain periods are poorly represented by all systems with a general underestimation of the observed long-term temperature trend, mostly in the summer season, even with respect to the corresponding global drivers. For precipitation, the Med-CORDEX simulations are closer to observations than the other datasets, with some improvement with respect to ENSEMBLES dataset. In general, all the systems experience difficulties in representing anomalies during specific periods or for specific regions. These appear in part due to limitations in the reanalysis boundary forcing data. For instance, in the second part of 1980s, the spatial patterns of surface air temperature during DJF/MAM are generally poorly represented, as well as the regionally averaged MAM/JJA surface air temperature decadal anomalies. Overall, the evaluation suggests limited improvement in Med-CORDEX simulations compared to ENSEMBLES, and a lack of sensitivity to resolution or coupling configuration, with persisting problems in part likely related to the representation of surface processes that could also affect the viability of future projections (e.g. the estimation of temperature trends). A set of decadal variability evaluation metrics, as applied in this study, could be useful in the context of a broader evaluation framework.