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Relevance of ERA40 dynamical downscaling for modelling deep convection in the Mediterranean sea

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A strong open-sea deep convection event was observed in the Northwestern Mediterranean sea during 1986-87 winter. This period was used as a case study to evaluate the impact of the spatial resolution of atmospheric forcing on ocean deep convection modelling. Twin numerical experiments were performed with a regional eddy-resolving oceanic model (SYMPHONIE) forced by atmospheric sets with different resolution. A low resolution atmospheric forcing extracted from the ERA40 reanalysis was compared with a high resolution forcing coming from a dynamical downscaling of ERA40. A high resolution climate model (ARPEGE-Climate) spectrally driven by ERA40 fields for the large scales provided the dynamical downscaling dataset covering the 1958-2001 period. The oceanic simulation performed under low resolution meteorological forcing did not reproduce the observed convection. The simulation performed under high resolution forcing correctly reproduced the convection event and the associated circulation. This was principally due to the enhancement of spatial and temporal meteorological extremes under the high resolution forcing. The results obtained for this case study proved the relevance of ERA40 (or GCM) dynamical downscaling techniques for the forcing of climate-scale Mediterranean sea simulations (reanalysis, climate change scenario).