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Ocean deep convection in the Mediterranean sea: 2012-2013 case study in the Gulf of Lions, from observations to multi-scale modelling.

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Ocean deep convection is a major process of interaction between surface and deep ocean, it indeed plays a major role in ocean heat and CO_2 uptake in a warming climate, sea level rise and nutrient storage for marine biology. In this study, ocean deep convection is investigated in the Gulf of Lions, the main deep water formation (DWF) site in the Western Mediterranean sea. Recent observations in the frame of MOOSE, HyMeX and Mermex programmes allow for a thorough analysis of 2012-2013 convective year.

The Mediterranean sea model NEMOMED12 (6km resolution) with its grid refinement (2km) is used as a numerical tool to characterize and understand ocean deep convection in 2012-2013. The model is initialized on august 1st 2012 using an ensemble of gridded reanalyses based on in situ observations (MOOSE 2012 ship cruise). The atmospheric forcing ALADIN-Climate is a dynamical downscaling of the ERA-INTERIM reanalysis at 12km and 3hr resolution over the 2012-2013 period. Near-Atlantic ocean conditions are damped towards ORAS4 reanalysis and river and Black Sea freshwater inflows are prescribed from climatologies.

An assessment of large-scale convection is done for 2012-2013 year in NEMOMED12 and observations, allowing for a characterization of its chronology, intensity, location as well as the hydrology of the main water masses involved.

This study addresses the respective impacts of atmospheric forcing, ocean preconditionning and mesoscale resolution to deep convection.