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HyMeX - Impact of the wind maximum spatial distribution on the deep convection in the North-Western Mediterranean

Karine Beranger[†]; Cindy Lebeaupin Brossier; Marie-NoÎlle Houssais; Philippe Drobinski; Michel CrÈpon; Jonathan Beuvier; Romain BourdallÈ-Badie; Yann Drillet; Nicolas Ferry; Florent Lyard
[†] ENSTA - ParisTech, France
Leading author: karine.beranger@ensta-paristech.fr

This modelling study focuses on the role of wind and heat loss distribution on deep convection process occurring in winter in the North-Western Mediterranean. Indeed, this region is affected by Tramontane and Mistral winds, often associated with a Ligurian flow between the Alps and Corsica, which generally results of a low-level through over the Thyrrennian Sea. Our study investigates the role of the wind maximum position and stationnarity on the formation of cyclonic gyres and deep convection in the Gulf of Lions and in the Ligurian Sea. Four long-term numerical experiments are analysed during the 1998-2002 period. Two different eddy-resolving ocean regional configurations are used, MED16 and MED12. They slightly differ in resolution by 1km, and, by the OPA code versions used (OPA is the ocean part of the NEMO system). MED16 is forced by ERA40 reanalyses (100-km resolution) and ECMWF analyses (50-km resolution) while MED12 is forced and coupled with WRF (20-km resolution) using a downscaling of ERA-Interim (80-km resolution). The MED12-WRF coupled model is part of the MORCE platform (Model Of the Regional Coupled Earth system). A 50-km resolution atmospheric model is able to well reproduce the Mistral and Tramontane maximum above the Gulf of Lions compared to a 100-km resolution atmospheric model. But a 20-km resolution atmospheric model is necessary to reproduce the wind maximum features above the Ligurian Sea. The stationnarity of these wind maxima above the cyclonic ocean gyres is a crucial element for the representation of the deep convection in winter. This effect is enhanced when the ocean model is coupled with the atmosphere in the Ligurian Sea, as simulated during the strong winter of 1999.