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HyMeX - The regional coupled system WRF-NEMO over the Mediterranean (MORCE plateform): impacts of mesoscale coupled processes on the water budget estimation

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The Mediterranean climate and water cycle are strongly affected by fine-scale and coupled processes, which generally involve all the Earth system compartments (ocean - atmosphere - land surface). Their investigation by modelling needs the development of accurate coupled and mesoscale numerical systems. We build at IPSL the MORCE (Model Of the Regional Coupled Earth system) plateform over the Mediterranean area. It includes the regional air-sea coupled system WRF-OASIS-NEMO. The horizontal resolutions are 20km for the non-hydrostatic atmospheric model WRF and 1/12o for the eddy-resolving ocean circulation model NEMO-MED12. The Sea Surface Temperature (SST) and fluxes exchanges between the two models are managed via the OASIS coupler. Three simulations are currently available: (1)The downscaling of the ERA-interim reanalyses (1989-2008) by WRF. This simulation is also part of the Med-CORDEX project; (2)The NEMO-MED12 simulation for the same period, driven by air-sea fluxes provided by simulation (1) every 3 hours; (3)The two-way interactive coupled run (MORCE experiment). The coupling frequency chosen is 3 hours. The comparison of the uncoupled/coupled runs is done to evaluate the role of mesoscale coupled processes on the water budget. Compared to reanalyses, the coupled system better represents the mean SST, especially in summer. The coupling produces mesoscale patterns in the turbulent fluxes that slightly modify the general and thermohaline circulations. In the atmospheric model, the SST modifications between uncoupled and coupled runs induce strong retroactions on the Precipitation (P) and Evaporation (E) fields. We found a significant spatial correspondence between the SST anomalies and the P and E anomalies. The fine-scale P anomalies extend over the coastal area, but the extension seems to be limited by the surrounding orography. The wind speed is also decreased in the coupled mode over the whole domain, except over some SST anomaly hot-spots. Finally, the annual cycles of P, E and E-P over sea show weak differences. This highlights that the coupled processes major role is the redistribution of the water at mesoscale.