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Long-term climate variability of the Adriatic Sea thermohaline properties using an ensemble of regional ocean hindcast simulations

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The Adriatic Sea has a substantial impact on dynamical properties and thermohaline circulation of the Eastern Mediterranean, through a large freshwater input and dense water formation processes that drive the thermohaline circulation of the Adriatic-Ionian basin. Together with Bimodal Adriatic-Ionian Oscillation (BiOS), it represents the major driving process of interannual and decadal variations in thermohaline properties of the Adriatic Sea and Central/Eastern Mediterranean. Recent findings, extracted from the long-term observations, implicate a change in driving Adriatic climate processes, which might be important for future climate of the whole Eastern Mediterranean. The reproduction of these processes may be challenging for climate models, as occurring over limited areas and over daily timescales at the most.
For that reason, an ensemble of NEMOMED regional ocean hindcast simulations with different spatial (10 and 6 km) and vertical (43 and 75 z-levels) resolutions, atmosphere (50 and 12 km resolution) and freshwater (from 8 to 43 river mouths in the basin) forcing have been analyzed, focusing on their representativeness for the Adriatic Sea dynamics. Furthermore, new Adriatic river climatology, developed recently within short-term oceanographic studies, has been imposed to the hindcast simulations with an aim to lower model biases. Half-centurial time series of temperature and salinity collected at the Palagruža Sill transect, and at the Jabuka and South Adriatic Pits known to be collectors of the Adriatic dense waters, were used for verification of models. The analyses focused on the reproduction of the Adriatic interannual and decadal variations, including their governing processes, dense water formation and BiOS for the 1980-2012 time period. Once becoming reliably reproduced, it will allow for an assessment of their importance and changes in future climate.