Abstract View

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A Sensitivity Study of the General Circulation of the Western Mediterranean Sea. Part II: The Response to Atmospheric Forcing

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ABSTRACT

This paper investigates the influence of sea surface thermohaline fluxes and wind stress on the circulation of the Western Mediterranean Sea using a high-resolution 3D primitive equation model. An 18-year experiment was forced with the daily output of a fine grid mesh numerical weather prediction model. The major characteristics of the circulation are well reproduced. The basin surface circulation is cyclonic over all of the basin. The two anticyclonic Alboran gyres are present. The instabilities of the Algerian Current generate large anticyclonic eddies that invade the whole Algerian Basin. The Liguro–Provençal–Catalan Current is well marked. Deep water convection down to the bottom only occurs during the first 3 years, then winter intermediate water is produced. The north–south gradient of the atmospheric thermohaline fluxes induces a northward surface transport of water from the Algerian Basin into the Liguro–Provençal Basin. This pattern can be associated with the Balearic front. Sensitivity experiments show that the wind stress curl reinforces the cyclonic circulation of the Liguro–Provençal Basin through a Sverdrup balance mechanism and contributes to deep-water formation. It is also suggested that the variations of the transport in the Corsican Channel are linked to the wind stress action rather than the heat flux gradient between the Tyrrhenian and Ligurian Seas.

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