LIW FORMATION AND SPREADING : A 3–D NUMERICAL STUDY

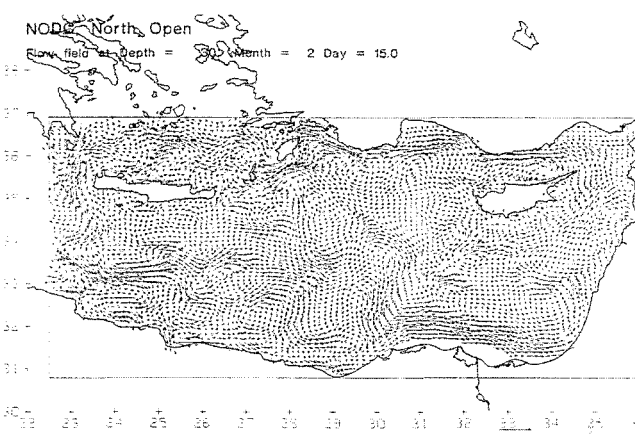
A. LASCARATOS, K. NITTIS and L. PERIVOLIOTIS

University of Athens, Department of Applied Physics,
Lab. of Meteorology and Oceanography, Athens, Greece

The Levantine Intermediate Water (LIW) is the characteristic saline water mass of the Eastern Mediterranean that is formed in the Levantine sea. Various hypotheses have been introduced on the mechanism and the exact location of this formation, most of them indicating the Rhodes Cyclonic Gyre, in the northwestern Levantine, as the main formation site (OVCHINNIKOV, 1984; LASCARATOS *et al.*, 1993). During the spreading phase this water mass occupies the intermediate layers (typically 300 m) of the whole Mediterranean sea and exits through the straits of Gibraltar with modified, due to mixing, characteristics. It can be also found isolated at deeper layers, trapped by the energetic eddy field of the Eastern Mediterranean (THEOCHARIS *et al.*, 1993).

We use POM, a sigma coordinates, free surface, 3–D primitive equation model (BLUMBERG & MELLOR, 1987) to study the LIW formation and spreading in the Levantine sea. The model contains an imbedded second moment turbulence closure sub–model to provide vertical mixing coefficients. The area (east of 22.5E) is covered by a 220 x 120 high resolution (5–6 km) eddy resolving grid (first baroclinic Rossby Radius ~13 km). In the vertical 30 sigma–coordinate levels with logarithmic distribution near the surface are used. Open boundary conditions are used for the communication with the Ionian (to the West) and the Aegean sea (to the North).

The model will be initialized with POEM hydrological data and forced by heat and water fluxes computed from the model's SST and atmospheric parameters taken from the NMC data set (CASTELLARI *et al.*, 1990). The POEM–V data set (August – September 1987) is currently being analyzed to fit the model grid. Objective analysis is being used for the horizontal interpolation while vertical extrapolation through EOFs is being considered since most of the casts do not exceed 2000 m. The model will be forced with the September 1987 – April 1988 twice a day NMC fluxes. Currently, a number of sensitivity tests are being carried out using climatological initial (Levitus or NODC data sets) and forcing data (NMC 1980–1988 monthly climatology). One of the main goals of these customization runs is to investigate the ability of the model to reproduce the main circulation features of the Levantine Sea under different model configurations. A typical summer surface circulation field as reproduced by the model is presented in figure 1. Most of the well known upper thermocline features of the area (ROBINSON *et al.*, 1991) can be recognized, namely : a. The Mid–Mediterranean Jet entering from the west and transporting the Atlantic Water towards the Levantine; b. The Asia Minor Current flowing westrard along the southern coast of Turkey; c. The Rhodes cyclonic gyre bounded by these two jets; d. The extended anticyclonic Mersa–Matruh gyre south of Crete; e. The Shikmona anticyclonic gyre south of Cyprus and f. The West Cyprus cyclone. This realistic circulation field is a significant prerequisite for our LIW formation and spreading studies.



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