DISTRIBUTION OF THE SURFACE AND INTERMEDIATE WATER MASSES INFERRED FROM THE XBT-THETIS 2 TRANSECTS ACROSS THE WESTERN MEDITERRANEAN SEA

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The THETIS 2 experiment is conducted by IFM-Kiel, IACM-Heraklion, IFREMER-Brest and COM-La Seyne/mer within the framework of MAST 2 (SEND, 1995). Its aim is to check the capability of tomographic measurements to evidence large scale temperature variations in the western Mediterranean Sea. Among the 7 tomography moorings set in place for ~10 months in 1994 in the whole Algero-Provençal Basin, 2 have been positionned on the route closely followed by a tanker navigating between Fos/mer (~5°E, France) and Skikda (~7°E, Algeria). During that time, 24 calibrated XBT-T7 probes (accuracy of 0.05°C instead of 0.1°C; nominal depth ~760 m) have been launched, twice a month, every ~25 km between these two moorings. Beside the forthcoming tomography results, new valuable information about the distribution and variability of the Modified Atlantic Water (MAW), the Winter Intermediate Water (WIW) and the Levantine Intermediate water (LIW) has been collected which closely agrees with our schematic circulation diagrams (MILLOT, 1987) and analyses performed up to now. In the Gulf of Lions, the February sections were typical of the preconditionning phase of the Western Mediterranean Dense Water (WMDW) formation. A relatively cool (12.5-13.0°C) and thick (200-400 m) mixed layer was separated from below by a relatively thin (~100 m) thermocline (~0.5°C). Thereafter, due to exceptionally mild weather conditions, this whole surface layer was found, in mid-March, with a larger temperature (~13.1°C) before being entirely caped, in late March (fig.1), by an unusually warm (~13.5°C) superficial layer. Then, worse weather conditions occurred which led, in mid-April (fig.2), to a stratification similar to that encountered one month ago (mean temperature of ~13.1°C down to ~200 m). Even if the 25-km space scale is not sufficiently small to provide definitive information about mesoscale features, it is interesting to note that, during the whole experiment, the most homogeneous profile has been collected in mid-April. The North Balearic Front, which delimits the northward spreading of MAW in the Algerian Basin, is clearly evidenced near 40°30'N, mainly contrasting with the generally low stratification in the zone of dense water formation. From the beginning of May, the seasonal thermocline sets up, as usual.

According to our most recent analyses, WIW is cooled and homogeneized MAW which has been covered by less modified MAW advected from neighbouring places. Even if mainly formed in the northern part of the basin, it has been recognized by its temperature minimum in two specific places. One is just south of the North Balearic Front (~12.9°C at ~250 m) and often associated with an underlying lens of LIW, as if both water masses were entrained by a cyclonic rim current surrounding the zone of dense water formation. The other is in the Algerian Basin, where WIW appears as lenses with less low temperatures (~13.1-13.2°C). These lenses are supposed to have been entrained first from the Spanish continental slope to the Algerian one by the flow of recent MAW, and then in the interior of the Algerian Basin by mesoscale eddies.

Some of the LIW is distributed in a roughly similar way. In addition to its association with WIW south of the North-Balearic Front, LIW is found along the French continental slope clearly flowing westwards as a quasi-permanent vein (~13.4-13.5°C). The LIW having the less large temperatures, and thus expected to be the oldest and more mixed water, is generally found close to the Algerian continental slope. This clearly supports our recent hypothesis suggesting that, as WIW, LIW can be entrained too from Spain to Algeria, and then eastwards. Of major interest is the fact that the less-mixed LIW (up to ~13.9°C) is distributed in the interior of the Algerian Basin in the form of mesoscale accumulations (width sometimes greater than ~50 km, thickness up to ~200 m at 300-400 m). This distribution dramatically changes from one transect to the other (see fig.1 and 2). This LIW is relatively unmixed so that, according to our 1987 schematic diagrams, it is expected to have been entrained away from the Sardinian continental slope and then trapped by mesoscale eddies. In order to get more precise information about these accumulations, we presently take advantage of the return trip and launch, at a space scale as small as possible, standard XBT's.

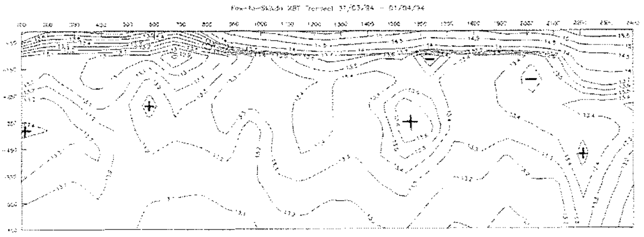

Fig. 1 : 31/03/94. XBT transect from ~5°E close to France (left-hand side of the figure) to ~7°E close to Algeria. Relative maxima (minima) at intermediate depths are noted by + (-).

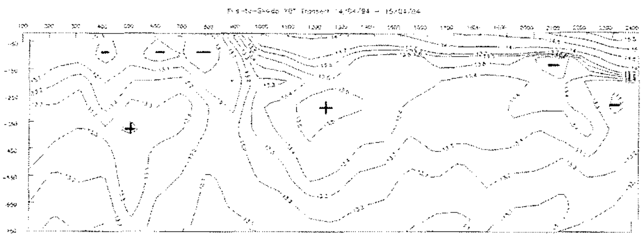

Fig. 2 : 14/04/94. XBT transect from ~5°E close to France (left-hand side of the figure) to ~7°E close to Algeria. Relative maxima (minima) at intermediate depths are noted by + (-).

REFERENCES

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SEND U., 1995. *Rapp. Com. Int. mer Médit.*, 34.