

Observations of deep water formation in the Gulf of Lions during THETIS

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From November 1991 to April 1992 an experiment was carried out in the northwestern Mediterranean (Gulf of Lions) convection region. The objective was to study with a variety of methods and on a variety of scales the processes involved in the deep convective overturning of the water column which occurs during periods of strong surface cooling (associated with Mistral and Tramontaine winds). Apart from standard current meter moorings and several hydrographic/tracer cruises with continuous shipboard thermosalinograph and ADCP (Acoustic Doppler Current Profiler) sampling, the experiment comprised a moored array with two components dedicated to the extreme spatial scales of the processes. A small-scale (2km) triangle of moorings with ADCP, thermistor chain, and high-precision temperature/salinity recorders was aimed at resolving the individual convective plume scale. A large-scale (100-200km) array of 6 acoustic tomography moorings was designed to yield the large-scale changes in stratification and the convection patch as a function of time.

Preliminary analysis of the meteorological data and of the vertical currents from the moored instruments shows that some shallow mixing events probably occurred during December and January, and that the main deep overturning took place in mid-February during the first days of our longest verification cruise. This enabled us to obtain a good ship survey of the convection patch. Within the fresh patch which could be mapped well with the salinity and density signal from the thermosalinograph, the water column had become extremely homogeneous down to depths of about 1600m. Both moored and shipboard ADCP measurements indicated large downward currents during the event. Subsequently, the patch became more fragmented, with intrusions of stratified water from outside the patch at individual depth ranges. At this stage, both the thermosalinograph tracks and the CTD profiles showed high spatial variability. Depending on the processing stage, a preliminary view of the acoustic tomography data will also be presented. Part of the array was not operational during the period leading up to the main convection event, but the temporal evolution of the stratification should be visible during much of the time along various sections through the array.