# EAST MEDITERRANEAN TRANSIENT AND DENSE WATER DYNAMICS IN THE AEGEAN SEA

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## Abstract

The relation between East Mediterranean Transient (EMT) and deep water formation in the Aegean Sea is studied using the last two decades of infrared satellite data, available hydrological data and a theoretical model based on the dynamics of density currents crossing and outflowing from a strait. The results of this analysis were then interpreted in the light of the simulations produced by a numerical model for the last 40 years.

*Keywords: Deep Waters, Aegean Sea*

Dense water formation processes play a fundamental role on the thermodynamics of the Mediterranean Sea. Such processes in the Aegean Sea are known from a very long time. Lacombe et al. [1] stated how the North Aegean very dense waters are probably renewed by the dense waters formed in wintertime in the gulf of Saros. Miller [2] reported deep temperatures from 10.0 to 14.5 ºC which, together with the high salinity, made this sea particularly interesting on thermodynamic grounds. El-Gindy and El-Din [3] estimated that about 50% of the dense waters in the Cretan Sea were originated in the Mount Athos region. Recently such processes received a remarkable attention as main sources of the Eastern Mediterranean Transient. During the CIESM Workshop on Dynamics of Mediterranean deep waters (Malta, 27 - 30 May 2009, published as CIESM Monograph 38), among other fundamental points attention was focused on the origin of this EMT. Some further analyses were therefore suggested as a detailed investigation about the dense water formation regions as the Cretan Sea, the Turkish shelf (Limnos Plateau) or the Northern Aegean (Samothraki Plateau). We therefore analyzed historical satellite images (year 1985-2009) of the whole Mediterranean Sea comparing sea surface temperature anomalies of the Adriatic Sea with the corresponding ones observed in the Aegean Sea. SST maps where kindly provided by the GOS laboratory of ISAC/CNR in Rome (http://gos.ifa.rm.cnr.it).

Then we used the available hydrologic data of the Aegean Sea to validate the results of such satellite comparison . We so obtain a yearly estimate of the dense water production of these two very thermodynamic seas, to check the original estimate of El-Gindy and El-Din [3]. One has to remark a fundamental difference between the Adriatic (with a rather simple and flat morphology) and the very complex Aegean sea bottom. There are some depressions, as the North Sporades Basin (~ 1500 m maximum depth), the Mount Athos Trough (~ 1000m maximum depth) and the Trough between Samothraki and Limnos (~ 1600 m maximum depth) in its northern part only, that can play the role of dense water reservoirs. These estimates are compared with results of recent numeric experiments [4] that interestingly evidence the role of the northern Aegean shelf dense waters on the basin thermodynamics and the importance of the Eastern Mediterranean Transient. Comparing numerical and satellite data we focus our attention on the possibility that similar but less intense outflows from the Aegean could have happened previously in the past. We finally study the effect of a novel version of the classical Bernoulli suction that takes into account entrainment and bottom friction [5] to emphasize outflow from a marine strait, as Antikithira, Kithira and Kassos [6].

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