Session: C4 Poster: TH228A

MedCLIVAR Mediterranean Climate Variability: Thermohaline variability in the western Mediterranean Sea

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The Mediterranean Sea is in many ways a miniature ocean. It has deep water formation varying on interannual time scales and a well-defined overturning circulation, and there are distinct surface, intermediate and deep water masses circulating between the western and the eastern basin. What makes the Mediterranean particularly useful for climate change studies is that its time scale is much shorter than for the global ocean, with a turnover of 60 years compared with 500 years for the global ocean. Changes can happen faster, on the time scale of a human lifetime. Thus the Mediterranean is useful as a laboratory for documenting changes within it (and hence anticipating similar changes in the global ocean) and for understanding the role of key processes involved in climate change (thus to make inferences on those processes on the global scale). Even if generally the description of the large-scale thermohaline circulation relies on this hypothesis, the Mediterranean is not a steady system. On the contrary, during the last decades, significant changes of the deep water have been observed both in the eastern basin (Eastern Mediterranean Transient, EMT) and in the western basin (Western Mediterranean Transition, WMT). In the deep layers of the western basin, a constant trend towards higher salinity and temperature has been observed since the 50's. More recent observations evidenced an acceleration of this tendency. An alteration of the stratification, an abrupt temperature and salinity increase have been observed since 2005. This new deep water has spread out into the western Mediterranean so that now it forms a bottom layer of warm salty water up to 1000 m thick throughout the western Mediterranean basin. This presentation aims at promoting a discussion about extension, causes and effects of this remarkable event, in the context of longer term changes of the Mediterranean climate.