Geophysical Research Abstracts
Vol. 15, EGU2013-13197, 2013
EGU General Assembly 2013

Modeling the Levantine Intermediate Water: sensitivity of CFC distribution on the Eastern Mediterranean Transient representation and implications on anthropogenic CO_2 uptake.

Thomas Arsouze (1), Julien Palmiéri (1,2), Jean-Claude Dutay (2), Karine Béranger (1), Jonathan Beuvier (3), James Orr (2), and Samuel Somot (4)

(1) ENSTA-ParisTech, Palaiseau, France, (2) LSCE, IPSL, Saclay, France, (3) Mercator-Océan, Toulouse, France, (4) CNRM, Toulouse, France

Levantine Intermediate Water (LIW) is considered as one of the major water masses of the Mediterranean Sea. The main formation area of LIW is located in the northern Levantine Basin, and it further spreads westwards as a maximum-salinity layer at few hundred meter depth through the whole Mediterranean Sea. The LIW is then involved in formation of the Eastern Mediterranean Deep Water (EMDW) originally know to be formed in the Adriatic Sea. The LIW can therefore be considered as a major contributor to CO_2 uptake and export in the Mediterranean Sea. During the Eastern Mediterranean Transient event (EMT, 1991-1993), the EMDW formation site shifted from the Adriatic Sea to the Aegean Sea.

Previous studies emphasized the influence of EMT on the LIW formation and thermohaline characteristics, with implications on CO_2 export. In this study, we investigate the influence of EMT on LIW characteristics during the EMT period according to CFC passive transient tracer distribution. We use the oceanic NEMO-MED12 (1/12°, ∼8-10km) model, forced by ARPERA atmospheric fields, starting in 1959 up to now, to run CTL and EMT experiments. CTL experiment differed from the EMT experiment by the use of stronger winds and heat loss over the Aegean Sea during the EMT period in the latter, leading to a better reproduction of the Cretan Water Overflow. Then, CFC and anthropogenic CO_2 distributions are modeled off-line, for both CTL and EMT experiments.
We can see that our model, especially for the EMT experiment, successfully reproduces the LIW main characteristics, with the isopycnal $\sigma\theta$=29.05 located in a salinity maximum, at the same depth as previously observed. CFC distribution in the LIW is also in good agreement with the available data both in September 1987 (pre-EMT) and January 1995 (post-EMT). January 1995 CFC distribution in EMT experiment shows changes compared to the CTL, that can later on lead to errors on CO_2 export estimates with the Time Transient Distribution method. This sensitivity test emphasizes the importance of simulating an accurate Aegean outflow that further changes LIW formation and pathway during the EMT period. The role of the meso-scale processes on CFC distribution, and the implications on model / data comparison, is also discussed.