



Global Warming altered the Black Sea ventilation regime

Arthur Capet, Vandenbulcke Luc, and Grégoire Marilaure
MAST, ULiège, Liège, Belgium (acapet@uliege.be)

Life in the Black Sea is confined in a thin surface oxygenated layer. The vertical extent of this oxygenated layer, restricted now to the upper 100m of the 2000m water column, has considerably reduced over the last decades (44% of volume loss since 1955, Capet et al. 2016), with expected pressure on living stocks due to habitat compression.

The formation of cold water in winter and its accumulation in the Cold Intermediate Layer (CIL) is known as an annual ventilating mechanism, essential to maintain oxygenated conditions at intermediate depth. Recent years have shown the lowest oxygen inventories co-occurring with the lowest CIL cold content, suggesting a weakening in the process of convective ventilation.

To explore the long-term variability of this key ventilation process, we produced a composite time-series for the Black Sea CIL cold content based on a collection of observations (Ship casts, Argo), empirical and mechanistic modelling (3D). The close correspondence between purely observational and purely mechanistic predictive approaches suggests a high reliability for this description of the Black Sea Cold intermediate layer evolution during the last 60 years.

A structural change analysis confirms that restricted ventilation prevails since 10 to 15 years in the Black Sea, that is significantly anomalous with respect to the past 60 years. A closer (intra-annual) look further suggest that new CIL formation, ie. the convection of a new cold water mass joining the remaining of last year CIL, has now become occasional rather than annual. We discuss here the potential biogeochemical implications of this altered ventilation regime.

Capet, Arthur, et al. "Decline of the Black Sea oxygen inventory." *Biogeosciences* 13 (2016): 1287-1297.