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Understanding the dynamics of the oxic-anoxic interface in the Black Sea

Emil V. Stanev (1), Pierre-Marie Poulain (2), Sebastian Grayek (1), Kenneth S. Johnson (3), Hervé Claustre (4), and James W. Murray (5)

(1) Helmholtz-Zentrum Geesthacht, Institute for Coastal Research, Geesthacht, Germany (emil.stanev@hzg.de), (2) Istituto Nazionale di Oceanografia e di Geofisica Sperimentale – OGS, Trieste, Italy, (3) Monterey Bay Aquarium Research Institute, USA, (4) 5Laboratoire d'Océanographie de Villefranche, France, (5) 6School of Oceanography, University of Washington, Seattle, U.S.A.

The Black Sea, the largest semi-enclosed anoxic basin on Earth, can be considered as an excellent natural laboratory for oxic and anoxic biogeochemical processes. The suboxic zone, a thin interface between oxic and anoxic waters, still remains poorly understood because it has been undersampled. This has led to alternative concepts regarding the underlying processes that create it. Existing hypotheses suggest that the interface originates either by isopycnal intrusions that introduce oxygen or the dynamics of manganese redox cycling that are associated with the sinking of particles or chemosynthetic bacteria. Here we reexamine these concepts using high-resolution oxygen, sulfide, nitrate and particle concentration profiles obtained with sensors deployed on profiling floats. Our results show an extremely stable structure in density space over the entire basin with the exception of areas near the Bosporus plume and in the southern areas dominated by coastal anticyclones. The absence of large-scale horizontal intrusive signatures in the open-sea supports an hypothesis prioritizing the role of biogeochemical processes.