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Hypoxia monitoring activities within the FP7 EU-project HYPOX: diverse approaches to understand a complex phenomenon

F. Janssen (1), C. Waldmann (2), A. Boetius (3), and the HYPOX project Team

(1) Max Planck Institute for Marine Microbiology, Bremen, Germany (fjanssen@mpi-bremen.de), (2) MARUM Center for Marine Environmental Sciences, University Bremen, Bremen, Germany, (3) HGF-MPG Joint Research Group on Deep Sea Ecology and Technology, Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany

Hypoxic conditions in aquatic systems and the occurrence of 'dead zones' increase worldwide due to man-made eutrophication and global warming with consequences for biodiversity, ecosystem functions and services such as fisheries, aquaculture and tourism. Monitoring of hypoxia and its consequences has to (1) account for the appropriate temporal and spatial scales, (2) separate anthropogenic from natural drivers and long-term trends from natural variations, (3) assess ecosystem response, (4) use modeling tools for generalization and prediction, and (5) share data and obtained knowledge. In 2009 the EU FP7 project HYPOX (www.hypox.net) started out as a pioneering attempt to improve and integrate hypoxia observation capacities addressing these requirements. Target ecosystems selected for HYPOX cover a broad range of settings (e.g., hydrography, oxygenation status, biological activity, anthropogenic impact) and differ in their sensitivity towards change. Semi-enclosed basins with permanent anoxia (Black Sea, Baltic Sea), are included as well as seasonally or locally hypoxic land-locked systems (fjords, lagoons, lakes) and open ocean systems with high sensitivity to global warming (North Atlantic - Arctic transition). Adopted monitoring approaches involve autonomous, cabled, and shipboard instruments and include static and profiling moorings, benthic observatories, drifters, as well as classical CTD surveys. In order to improve observatory performance, project activities encompass developments of oxygen sensors as well as calibration procedures and technologies to reduce biofouling. Modeling and data assimilation are used to synthesize findings, to obtain an in-depth understanding of hypoxia causes and consequences, and to improve forecasting capacities. For integration of the collected information into a global oxygen observing system, results are disseminated through the HYPOX portal following GEOSS data sharing principles. This presentation will give an overview of the scientific approach of HYPOX and highlight some key results comprising findings from individual ecosystems and indentified general patterns. The driving forces that lead to hypoxia are assessed as well as consequences of oxygen depletion for aquatic life and biogeochemical processes.