Geophysical Research Abstracts
Vol. 14, EGU2012-4652, 2012
EGU General Assembly 2012

Dissolved Oxygen decrease near the bottom of the Inner Saronikos Gulf affected by the Athens Sewage Outfall

A. Pavlidou, I. Hatzianestis, and R. Psillidou-Giouranovits

Hellenic Center for Marine Research, Institute of Oceanography, Anavyssos, Greece (aleka@hcmr.gr)

In this work, the depletion of dissolved oxygen near the bottom of the Inner Saronikos Gulf caused by the sewage discharges from the Psittalia Sewage Treatment Plant of Athens is studied. Evidence of the sewage plume diffusion is given by examining the distribution of the concentrations of coprostanol, a common fecal sterol, in the surface sediments of the area.

The environmental quality of Saronikos Gulf has been studied since 1987 within the framework of monitoring programs of Hellenic Center for Marine Research, providing important evidence of environmental change, especially after the operation of the Sewage Treatment Plant on the Psittalia Island. Since 1994, the sewage generated by the city of Athens (population approx. four millions) has been primarily treated in Psittalia Treatment Plant, diverting the effluent from the untreated shoreline discharged to sea-surface, to primarily treated deepwater by using multiport diffusers at the depth of 63 m. Since the end of 2004, the sewage of Athens city has been secondary treated. An approximate of 800.000 m^3 d^{-1} of treated waste is discharged into the inner Saronikos Gulf, carrying $\sim$100 x 10^6gC d^{-1}. This area is practically flat with a mean depth of $\sim$90 m, and a volume of $\sim$14 km^3. Apart from the treated sewage, no other potential sources of anthropogenic inputs exist in the area of the Inner Gulf.

Low Dissolved Oxygen (DO) values ($<$ 3.00 mL/L) were detected near the bottom of the Inner Saronikos Gulf, as the biochemical result of the oxidation of the organic matter which is carried by the wastewater effluents into the Inner Saronikos Gulf.

It seems that there is a systematic variation pattern of the DO values throughout a year, with a significant increase during February –March, due to the homogenization of the water column and the oxygenation of the deep layers.

The lowest DO concentrations were recorded at the stations located southwest and also in a distance from the Psitallia Sewage Plant ($\sim$6-14Km), indicating that the organic matter which is carried by the wastewater plume, follows the prevailing circulation and finally decomposes in a distance from the pipe, resulting to the DO decrease. The investigation of fecal sterols in the sediments (coprostanol values, coprostanol/cholesterol and coprostanol/coprostanol+cholestanol rations) confirms the sewage dispersion pathways. According to these results, although the whole area in a distance $\sim$14 km from the outlet is contaminated by human wastes, the sediments in a direction southwest of Psittalia were more seriously affected than in the southeast direction.

Additionally, historical data for the period 1992-2009 showed decreasing trend of the DO concentrations also near the bottom of the stations located southeast of Psittalia Sewage outfall. Consequently, the sewage plume from Psittalia Treatment Plant affects the DO concentrations near the bottom of the Inner Saronikos Gulf and the area within a circle of $\sim$ 14Km diameter is assumed to be sensitive, with relatively lower DO values that potentially can affect the zoobenthic and the benthopelagic communities.