富栄養化海域における貧酸素水塊の数値解析による再現と工学的改善効果の検討

—伊勢・三河湾における事例研究—

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Abstract

Using a numerical model, we reproduced an oxygen-depleted water mass that occurred during the summer in 1991, in Ise and Mikawa bay that comprise one of the most eutrophic estuaries in Japan. The most severely oxygen-depleted water mass appeared in the middle-basin of Ise bay and the inner-part of Atsumi bay, located in the east of Mikawa bay.

In these areas, particulate organic matter accumulated due to oceanographic features such as horizontal circulation in the upper-layer and down-welling on the off-shore sides. The latter feature ultimately obstructed the supply of dissolved oxygen to the inner-areas of the bays.

Carbon cycle and dissolved oxygen budgets for the bottom layer were calculated for these oxygen depleted areas. We found that bottom mud consumed the most oxygen (45~66%), followed by the degradation of particulate organic matter from the upper-layer (21~35%).

Using this numerical model, we evaluated the feasibility of improving technology to increase the dissolved oxygen content of water mass for these two areas. The calculation was based on the assumption that the upper water rich in dissolved oxygen was supplied to the bottom layer. The calculations were conducted in these cases. A supplement at 100m^3/min, that was the most biggest in realizable scale, slightly increased the dissolved oxygen concentration but was not sufficient to a low recovery of the macrobenthos community.