PRELIMINARY RESULTS FROM A SUB-PYCNOCLINAL BOX MODEL OF THE ELNA OXYGEN DATA

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The annual cycle of dissolved oxygen below the pycnocline is dominated alternately by different physical and biological processes. Despite this complicated forcing, the resultant behavior of the dissolved oxygen concentration is a fairly well-behaved, time dependent function and is easily observable. HOPKINS and DELLAPORTA (1989) demonstrated how an empirical model could be used to forecast hypoxia in the Northern Adriatic.

In the present work, the authors use recently observed data (ELNA Project) to provide a validation test of the model. The box model is also used as a point of discussion of the relative importance of the various processes affecting the concentration of oxygen in the Northern Adriatic.

The Northern Adriatic is divided into eight compartments on the basis of its mean circulation and water-mass structure. Each compartment is ascribed characteristic values for: benthic and lower-layer oxygen consumption rates; seasonal variations in the depth of the pycnocline; sub- pycnoclinal photosynthesis; and an advection source term. The estimates of the benthic respiration are taken from the box-core incubation studies performed during the various ELNA cruises and from the results of other recent studies. Photosynthetic production below the pycnocline is also estimated from rates observed during the ELNA cruises. The advective source term is taken from the observed circulations and oxygen concentrations. In some cases, the estimates were taken from the historical data summaries compiled by ARTEGIANI and RUSSO (1994).

The results demonstrate the susceptibility of the western and northern areas to hypoxia. The bottom waters of these areas are obviously exposed to greater surface loading. For the period of late spring through early summer, the rate of oxygen decrease is controlled by bio/chemical respiration processes. The advective contribution is negligible until the horizontal differences in the *in situ* respiration have created significant oxygen gradients. By mid-summer, advective replenishment decreases due to a more sluggish circulation. Perhaps more significant is that oxygen preferentially decreases in the western areas that are downstream and offshore of the Po Plume. In late summer, re-supply occurs primarily through the deepening of the wind-mixed layer. This empirical modelling approach, when combined with selective monitoring, provides a valuable forecast capability for areas threatened by hypoxia/anoxia events.

REFERENCES

HOPKINS T. S. and FRANCO DELLAPORTA 1990. A box model of the sub- pycnoclinal oxygen in the Northern Adriatic. Presented at the Marine Coastal Eutrophication Conference, Bologna, 20-21 March 1990.

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