

The impact of Scotian Shelf Water “cross-over” on the plankton dynamics on

Georges Bank: A 3-D experiment for the 1999 spring bloom

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Abstract

The 1999 March SeaWiFS images detected an intensive bloom on the southern flank of Georges Bank (GB). The bloom covered a large portion of the southern flank between the 60 and 200 m isobaths, and later extended to and connected with an even larger patch near the North-East Peak and Browns Bank. A three-dimensional (3-D) model experiment was conducted to examine the cause of the bloom and the impact of Scotian Shelf Water on the spring phytoplankton bloom dynamics. The Finite Volume Coastal Ocean Model (FVCOM) provided the hydrodynamic fields for Lagrangian particle trajectory, tracer and biological model experiments. Process-oriented modeling experiments showed that the formation of the phytoplankton bloom on the southeastern flank of GB is related to (1) transport of the Scotian Shelf Water, (2) wind- and tidally induced vertical mixing and surface cooling, and (3) the location of the salinity front. With sufficient nutrients from the slope, the bloom could result from *in situ* growth of phytoplankton near the slope where the stabilized salinity front is located. The model results suggested that an accurate simulation of the spatial distribution of temperature and salinity on GB, as well as the flow fields across the Northeast Channel, are prerequisites for modeling the lower trophic level biological system over GB.

Key words: Georges Bank, Spring bloom, Scotian Shelf Water, Cross-over, Numerical model, Finite Volume, Coastal Ocean Model