The thermal structure of a lake is defined by the development of a thermal bar and vertical stratification. Solar radiation causes the shallow near-shore waters of a lake to heat up and form a segment of warmer water. This is held in position by a segment of colder water. The segment of warmer water gradually extends towards the center of the lake and ultimately results in vertical stratification.

In a pristine, highly oligotrophic ecosystem like Lake Superior, development of the thermal bar is a ‘big signal’ and therefore an important phenomenon to be modeled.

**The EFDC Model**

To further our understanding of the thermal structure, an EPA-approved hydrodynamics model, Environmental Fluids Dynamics Code (EFDC) was applied to the western arm of Lake Superior. A model grid, consisting of ~4500 surface cells and 31 vertical layers was established to define the spatial extent and partitioning of the system under consideration.

Forcing conditions, consisting primarily of meteorological data, were set up over the simulation period (April to September). Boundary conditions of flow velocities and temperature were also applied to the open-ended eastern edge.

The output from EFDC includes water temperature, diffusivity coefficients and horizontal and vertical velocity components for each grid cell. A visualization software, WinModel, permits comparison of model output to measured data on a spatial and temporal scale.

**Future Work**

In addition to extending the study of differences in the thermal structure of Lake Superior’s ecosystem resulting from variations in ice cover during preceding winters, the following year will focus on applying mass transport from EFDC to a water quality model, RCA.

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