A STATUS REPORT ON NOAA'S COASTAL OCEAN FORECAST SYSTEM

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A predictive capability to forecast the state of the coastal oceans has been under development for the past six years. NOAA, including the National Weather Service and the National Ocean Service, together with Princeton University have endeavored to create a real-time, operational forecast system for U.S. coastal waters. The system as it is presently configured is based on the Princeton Ocean Model; obtains surface fluxes of momentum, heat, and moisture from NCEP's Eta atmospheric forecast model; includes tidal forcing for six tidal constituents; is forced along the model domain's open boundaries with climatological estimates of temperature, salinity, and transport; receives fresh water inputs along the its coastal boundary from major bays and rivers; and assimilates in situ and satellite-derived SSTs, sea surface height anomalies derived from TOPEX altimeter data and data on the location of the north wall of the Gulf Stream. The system, referred to as the Coastal Ocean Forecast System (COFS), produces daily 24-hour forecasts of 3-D temperature, salinity, currents, and water levels. The model forecast fields are stored at NODC in GRIB format and are available back to 1/1/97. In what follows, we first briefly indicate problems that we have dealt with in the past and some that we still face. Second, we mention an ongoing demonstration project that has given us an opportunity to provide a number of forecast products from COFS to selected marine users.

One problem encountered during the early stages of COFS development dealt with our specification of boundary conditions along the open boundaries of the model domain: from the U.S. East Coast out to 50W, and from ~28N to 48N. The climatological forcing that has been used to date is unsatisfactory and will be replaced, either by nesting the COFS inside a basin-wide circulation model, or by extending the existing open boundaries well beyond the areas of primary interest. Also, the specification of freshwater fluxes along the East Coast has been problematic. In this regard, we are in the process of replacing the existing climatological river outflows with daily observed values from the U.S. Geological Survey. Just northeast of Cape Hatteras where the Gulf Stream separates from the coast the model generates an anomalous anticyclonic meander similar in form to those produced in other ocean circulation models. This problem is believed to be associated with the model's spatial resolution (~10 km in this part of the model domain); and data assimilation has been effective in minimizing it.

A project sponsored by the National Ocean Partnership Program called the Coastal Marine Demonstration Project (CMDP), is in progress, to demonstrate the state-of-the-art in coastal marine forecasting to a selected group of marine users. Eight partners including three universities, two private companies, and three agencies within NOAA are participating in this demonstration. The demonstration area includes the Chesapeake Bay and the adjacent coastal ocean

from 32N to 42N, and from the coast out to 70W. The demonstration includes two phases: the first of which took place between June 16 and July 31,1999, and the second phase during February and March of 2000. Products from the COFS that were displayed and evaluated by the users during Phase 1 were SST, surface salinity, and surface currents. A sample 24-hour forecast of SST is shown in Figure 1. Overall, user and forecaster response to these forecast products was favorable. However, problems were encountered with the model-generated currents along the shelf in the mid-Atlantic Bight where the predicted direction of flow was predominantly to the North whereas the expected flow was to the south. Although direct observations were not available during this period, the consensus is that increased buoyancy fluxes along the coast may help to correct this situation. Model sensitivity studies are now underway to determine how the model-generated shelf circulation responds to increased river outflows. During the second phase of the CMDP, subsurface temperatures will be added to the suite of products that will be given to the users for their evaluation.

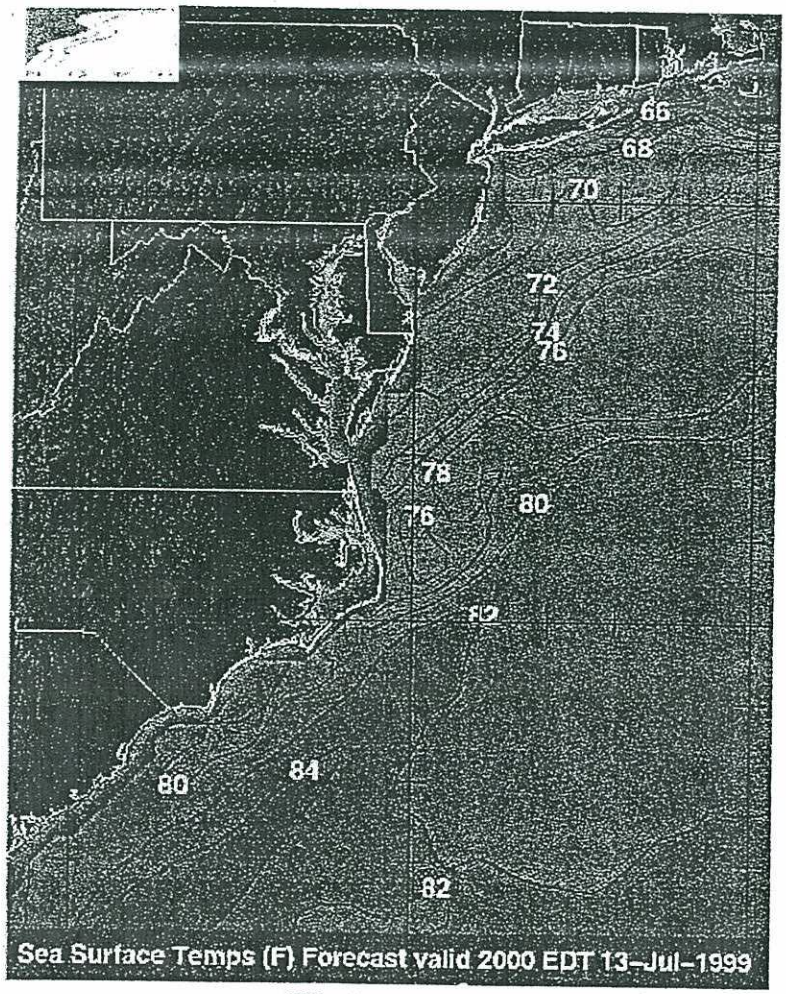

Figure 1. Twenty-four hour forecast of sea surface temperature(°F) from COFS produced for the Coastal Marine Demonstration Project.