

Naval Research Laboratory
Code 7250
Washington D.C. 20375

18 April 2001

Dear Doug,

Thanks for your call yesterday regarding the "ship response study/Norfolk project". I'm enclosing some references dealing with our work in and around Cape Henry. In particular, there are a number of fronts in the area that we have studied using ships and aircraft. These fronts have strong surface convergence and horizontal current shear, as well as strong vertical shear. The vertical shear is strong both on ebb and flood tide inshore of the main plume front.

I have analyzed three types of data: towed ADCP (Acoustic Doppler Current Profiler) data from about 2-meter depth to near bottom; moored ADCP data; and HF radar (OSCR) data. The towed data is directly under my control and much was collected in and near the pilotage area; the moored data is NRL data belonging to Zack Hallock; and the OSCR data belongs to the University of Miami. OSCR was deployed twice: September '97 and Oct/Nov '99. The very northwest part of the OSCR measurement domain lies near the 'CBJ' buoy. During the second OSCR deployment, five ADCP moorings (A1 to A5) were deployed and recovered. The enclosed Figure 1 from Hallock and Marmorino (submitted) shows the mooring locations. Note that mooring A2 lies along the edge of the outbound channel. Figure 6c from Hallock and Marmorino shows a sample across-shore section of eastward current. The positive contours in this figure show the plume from the Bay being advected offshore. Note the strong vertical shear in the upper 5 meters or so.

I am currently working with Dr. Colin Shen on testing his "velocity projection" technique, which estimates the current profile using only surface data. This technique is described in the enclosed JGR paper by Shen and Evans. Also enclosed is a page of sample (and preliminary) results at the site of mooring A4. Solid curves show eastward current; dashed, northward. The curves extending to the bottom are the inferred ("projected") profiles; the others are profiles measured by the ADCP. There is some nice agreement. Possibly we could do projections for your project in the vicinity of the CBJ buoy under various classes of environmental conditions.

In addition, let me mention that Colin Shen, Richard Mied and others here have time-dependent, non-hydrostatic, high-resolution models that have been used to investigate how the current profile varies across a channel and other bathymetric features.

Sincerely,


George Marmorino

Encl.: Various reprints and figures

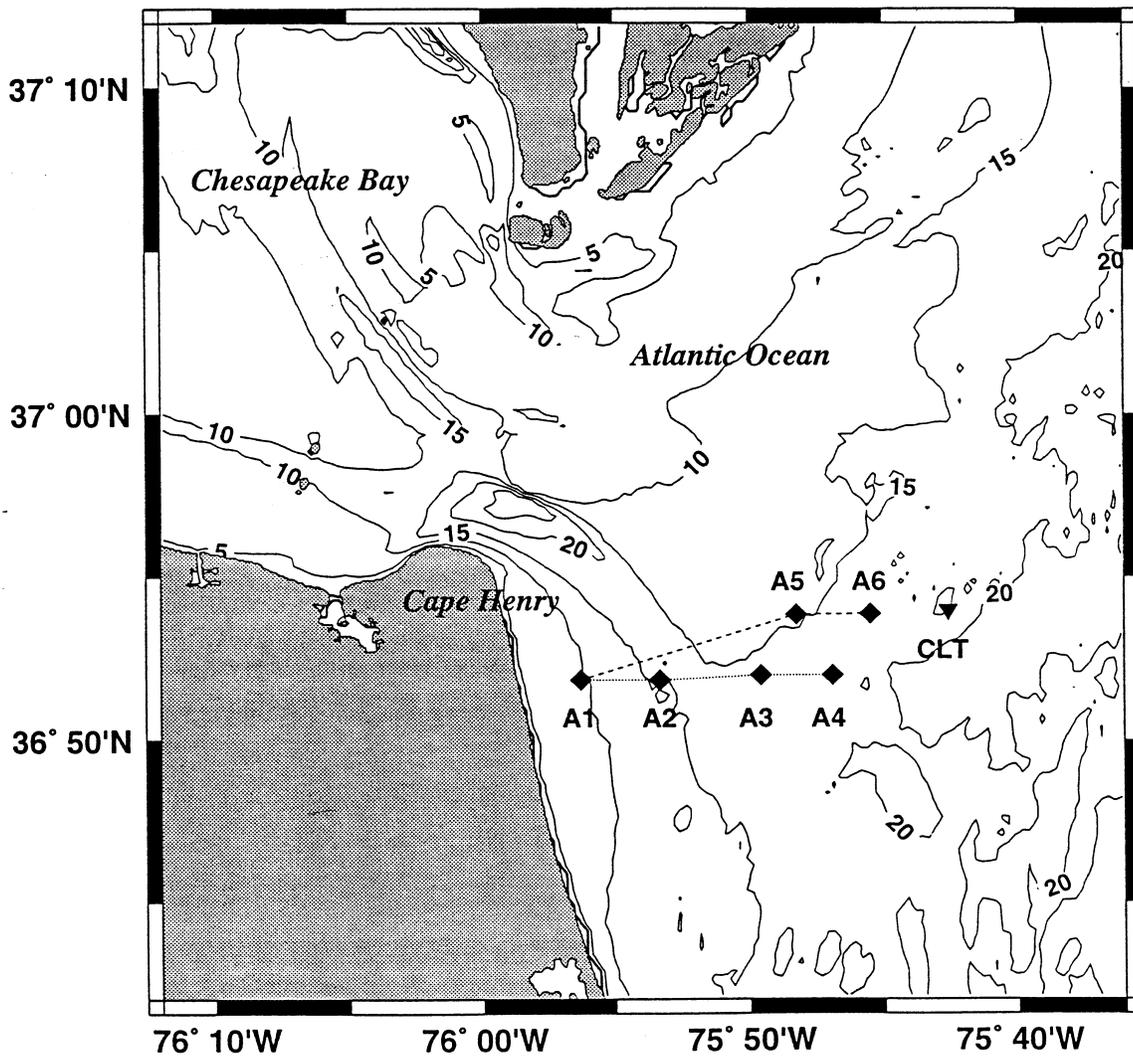


Figure 1 (Hallock & Marmorino, Submitted)

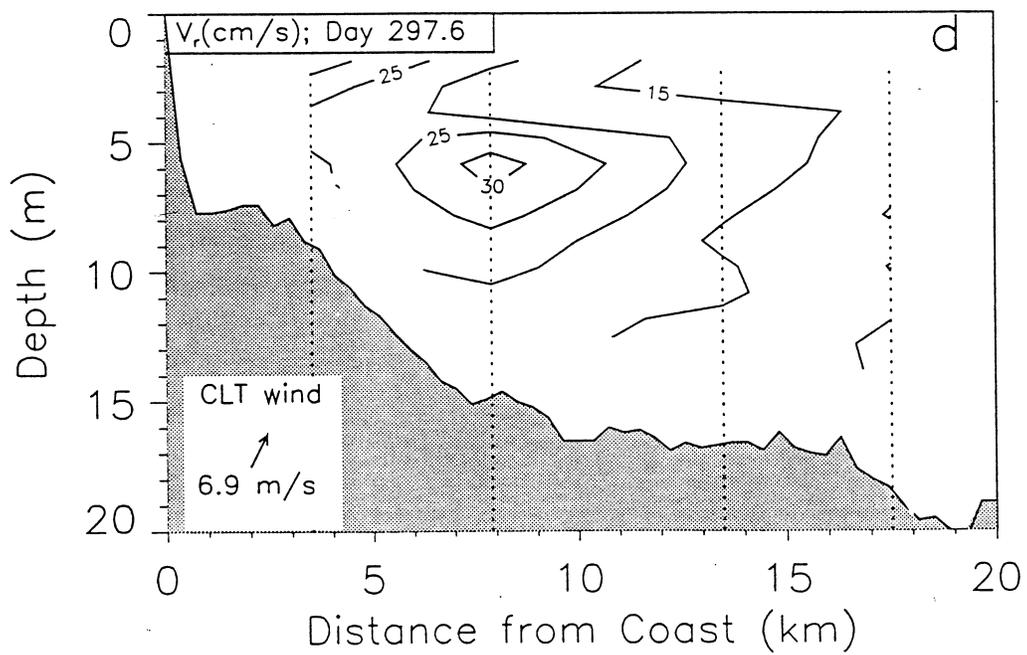
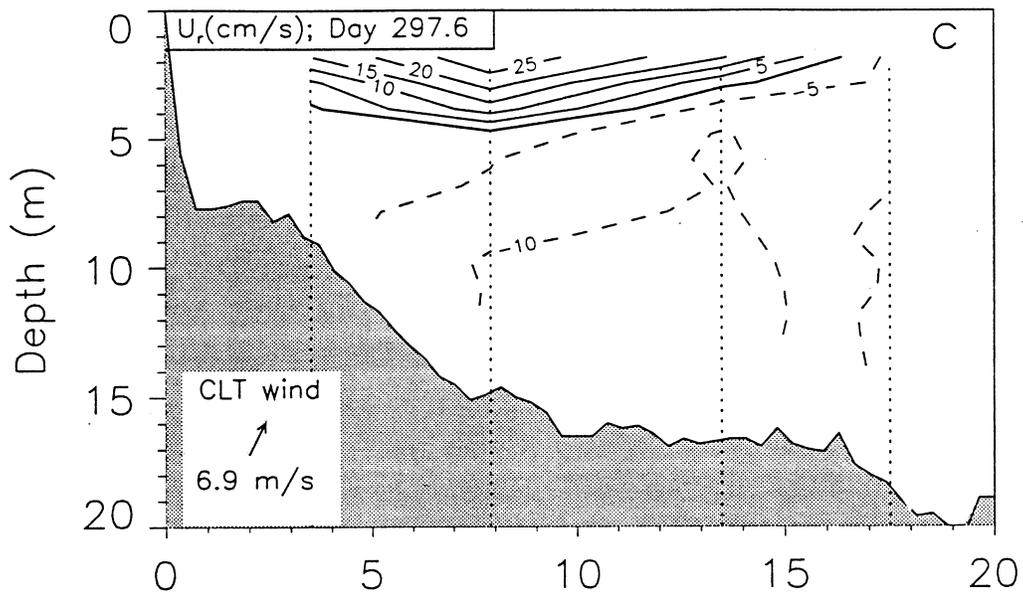


Fig. 6 (H&M, submitted)