Effects of Varying Winds and River Discharge on a Large Coastal Buoyancy Jet

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Salinity structure determines the density field and thus the resulting buoyancy-driven currents in regions influenced by outflow from rivers. River discharge varies relatively slowly and higher frequency atmospheric forcing can modify the associated low-frequency currents. The Naval Research Laboratory's Coastal Buoyancy Jets project has studied coastal systems with small and medium river discharge on the US east coast (Fig. 1) and has collaborated on analyses of a much larger system along the southeastern South American coast (Fig. 2) .

During summer of 2000, surveys were conducted off the New Jersey and Virginia coasts (Fig. 3) using moored and ship-based instrumentation as well as an airborne surface salinity imager (Fig. 4) . The coastal jet driven by discharge from the Hudson River (mean fresh water discharge = 700 m^3/s) was observed to be not affected by the much smaller Mullica River discharge but was highly susceptible to upwelling winds (Fig. 5) , being essentially sheared out and destroyed by a 2-day wind event. While it re-established itself after cessation of the wind, significant offshore flux of its low salinity water and associated suspended constituents is implied. The medium sized Chesapeake jet (mean discharge = 2200 m^3/s), while obviously affected by winds, appears to be more robust. Historical observations (Fig. 6) and recent numerical results (Fig. 7) indicate that a relatively cold low-salinity coastal jet originates from the much larger Rio de la Plata (mean discharge = 20,000 m^3/s) and remains coherent for several hundred kilometers northward along the coasts of Uruguay and Brazil, even extending 2000 kilometers northward to Rio de Janeiro under favorable wind and discharge conditions. Such a favorable combination of conditions often prevails in association with El Nino events.

Post-doc opportunities: Contact us for information about positions at NRL for observationalists and modelers with interest in coastal processes such as those presented herein.

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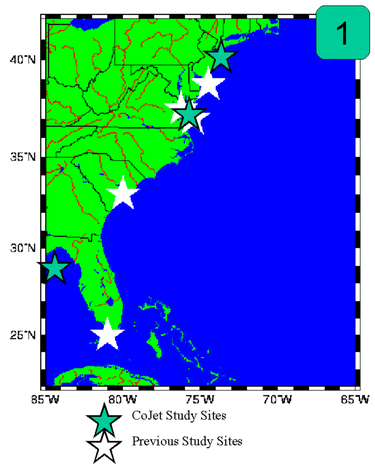
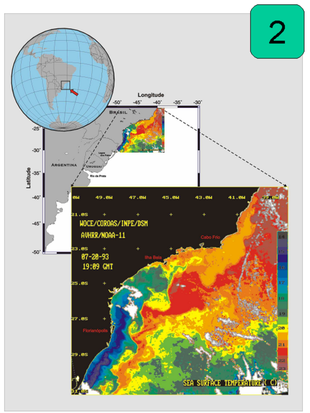
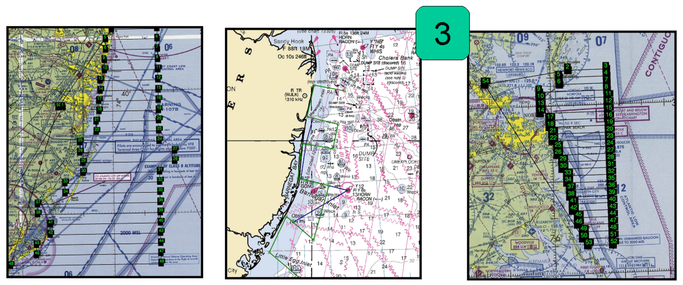
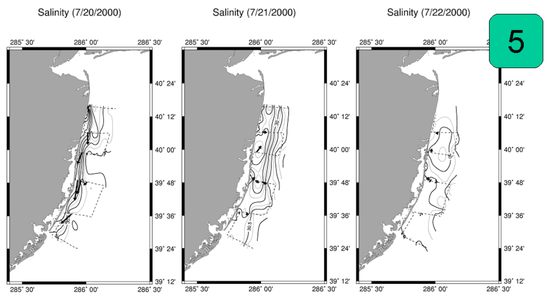


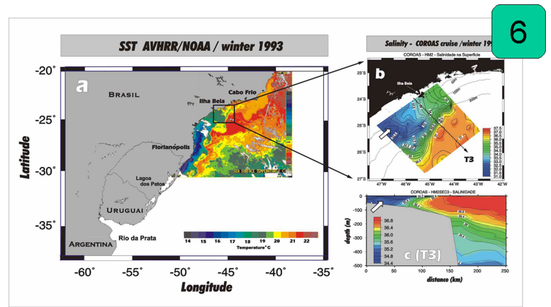


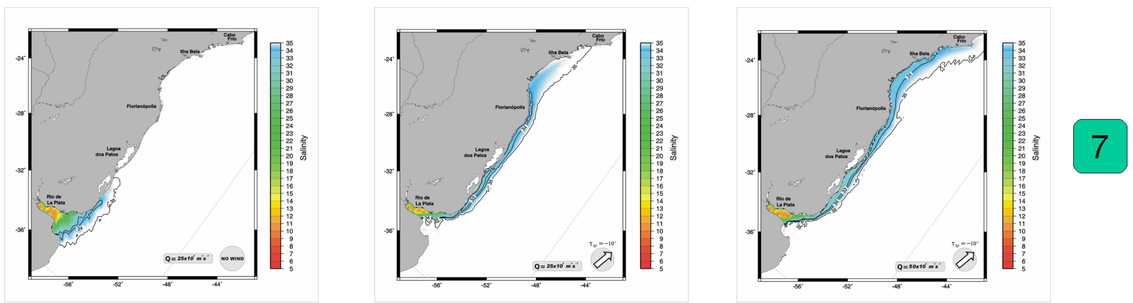


Comprehensive airborne salinity surveys (left) provide context for ship-based and moored measurements (right) off New Jersey.

Analogous Chesapeake survey.







Average Discharge = 10X Chesapeake

Average discharge & average winds

Strong discharge & average winds

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