



# Modeling the Hudson River Plume

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LaTTE: The Lagrangian Transport and Transformation Experiment

## Forecast System Configuration

The Hudson River plume and adjacent shelf circulation in the New York Bight were forecast in support of the 2005 *Lagrangian Transport and Transformation Experiment* (LaTTE) field program using the *Regional Ocean Modeling System* (ROMS) <http://marine.rutgers.edu/po/index.php?model=roms>

### Operational model configuration:

#### Domain:

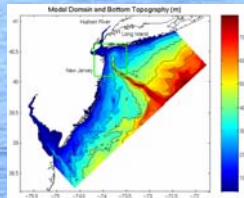
- central Long Island to mouth of Delaware Bay, out to approximately the 100-m isobath
- 1 km horizontal resolution; 30 vertical s-levels

#### Forcing:

- NCEP ETA hourly forecast  $u_{10}$  winds,  $T_{air}$ ,  $q_{air}$ , cloud from OPeNDAP server <http://nomad3.ncep.noaa.gov:9090/dods/nam/>
- Daily mean Hudson River flow from USGS Mohawk and Fort Edward gauges + persistence (for forecast) accessed via web using *GNU wget*
- Boundary tides from ADCIRC
- No boundary mean flow or pressure gradient at open boundaries

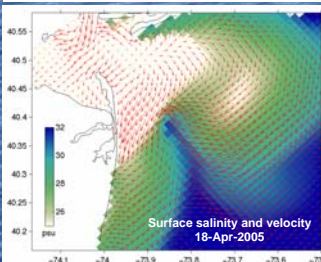
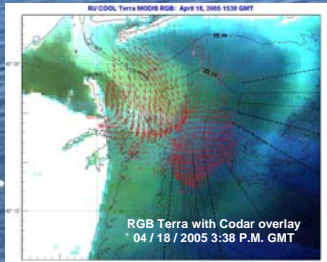
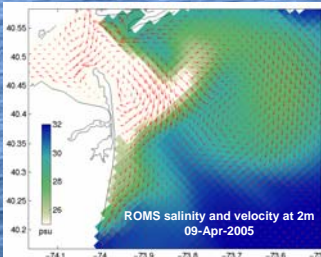
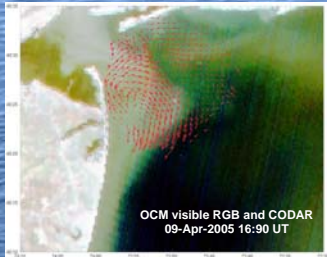
#### Output:

- Model runs daily to generate 48- to 60-hour forecast
- Output graphics at <http://marine.rutgers.edu/~wilkin/wip/latte/>
- Output data on OPeNDAP server <http://ahab.rutgers.edu:8080/dodsC/latte/daily/his.html>



## Observations

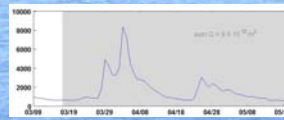
## Model



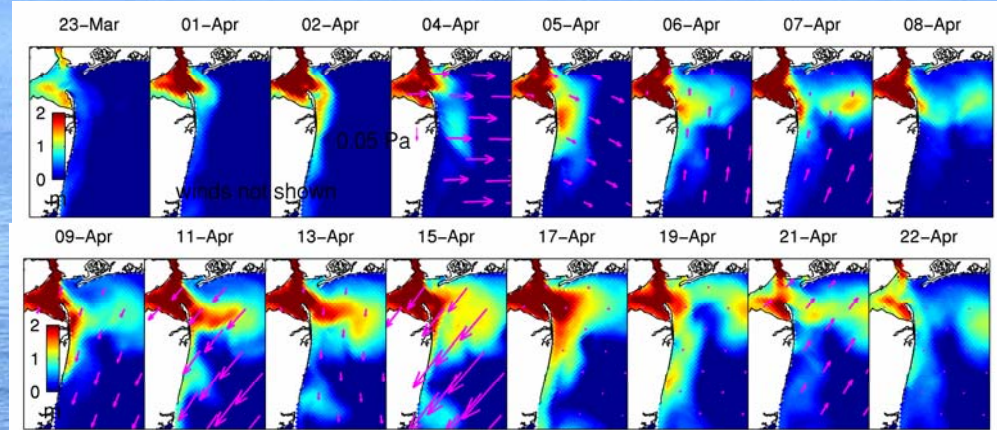
## Forecast plume variability – equivalent freshwater distribution

Equivalent freshwater depth =

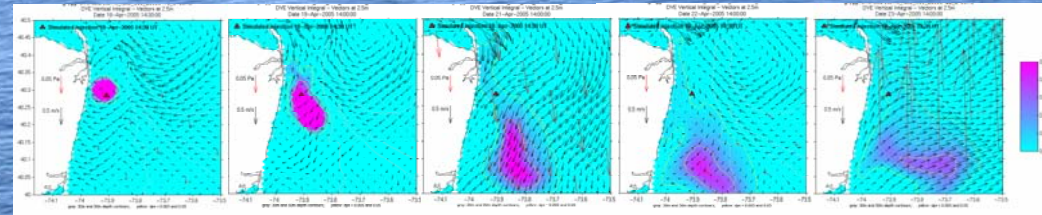
$$\int_{-h}^{\eta} \frac{S_o - S}{S_o} dz$$



Two high discharge events at the end of March and beginning of April.



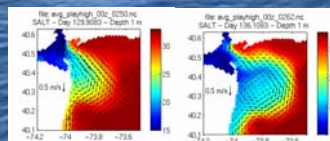
## Forecast dye trajectory: second injection



## Plume response under idealized wind scenarios

For high river discharge typical of the spring freshet, a set of idealized wind forcing simulations shows how the plume responds to wind direction.

No wind – freshwater bulge continues to grow



Southerly directs plume north of Hudson Shelf Valley and toward Long Island

Northerly amplifies coastal current and drains freshwater bulge

Westerly wind directs plume toward Hudson Shelf Valley

Easterly wind arrests plume

