CARIB-HYCOM: Progress and Plans

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Overview

- The Wide-Caribbean domain (CARIB-HYCOM)
  - Provide ocean modeling support to a large, multi-disciplinary study of ocean, atmosphere, and climate variability of the Caribbean region, emphasizing the nation of Antigua and Barbuda
    - "Integrated Ecological Assessment of Antigua and Barbuda"
    - Six-year project that is just commencing
  - Large regional domain chosen to permit studies of remote oceanographic processes that impact the Antigua and Barbuda region
  - Intended to be a resource that will be used for a wide range of scientific studies in the Caribbean region
    - e. g., the ocean response to hurricanes

Antigua-Barbuda Project

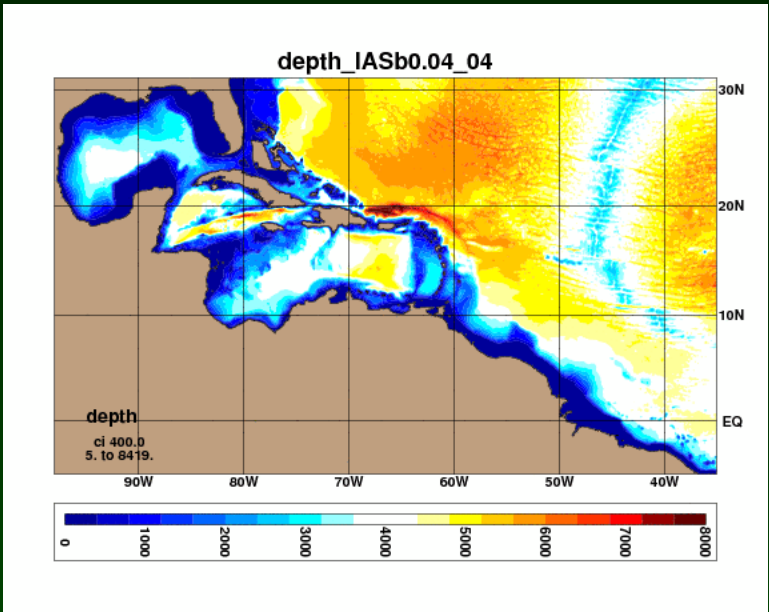
- The ocean model HYCOM component will contribute to:
  - Impacts of climate change
  - Ecological assessment and modeling
  - Ecosystem management
  - Marine resources and fisheries assessment
  - Spatial connectivity of organisms and ecosystems
  - Coupled ocean-atmosphere (climate) modeling
  - Natural hazards assessment (e.g., hurricanes)
  - Education and outreach

Modeling Strategy

- Initially perform ocean-only modeling
  - Downscaling required to model ocean variability at coastal to island scales
    - Global HYCOM => CARIB-HYCOM => Intermediate HYCOM => local models (ROMS)
    - Resolution ranging from 0.08° down to O(100 m)
    - First intermediate HYCOM will be ECARIB-HYCOM
    - First local model will focus on Antigua
  - Free-running simulations to be run first
    - Climatological demonstration run
    - Multi-year simulations, climatological and realistic
  - Data assimilative runs will be performed later
- Coupled climate modeling in later years

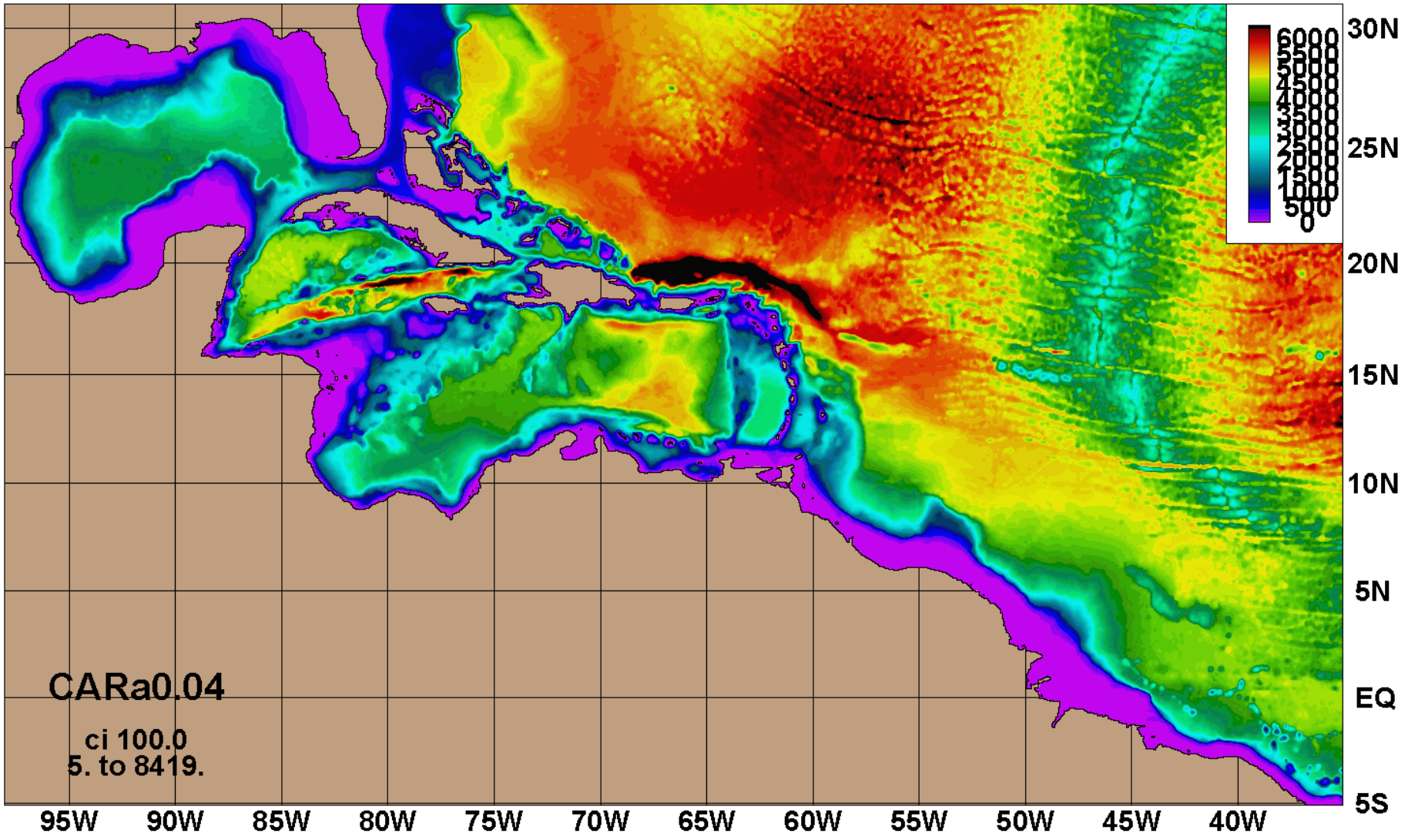
CARIB-HYCOM

- 1/25º resolution
- Domain: 98W-35W, 5S-31N

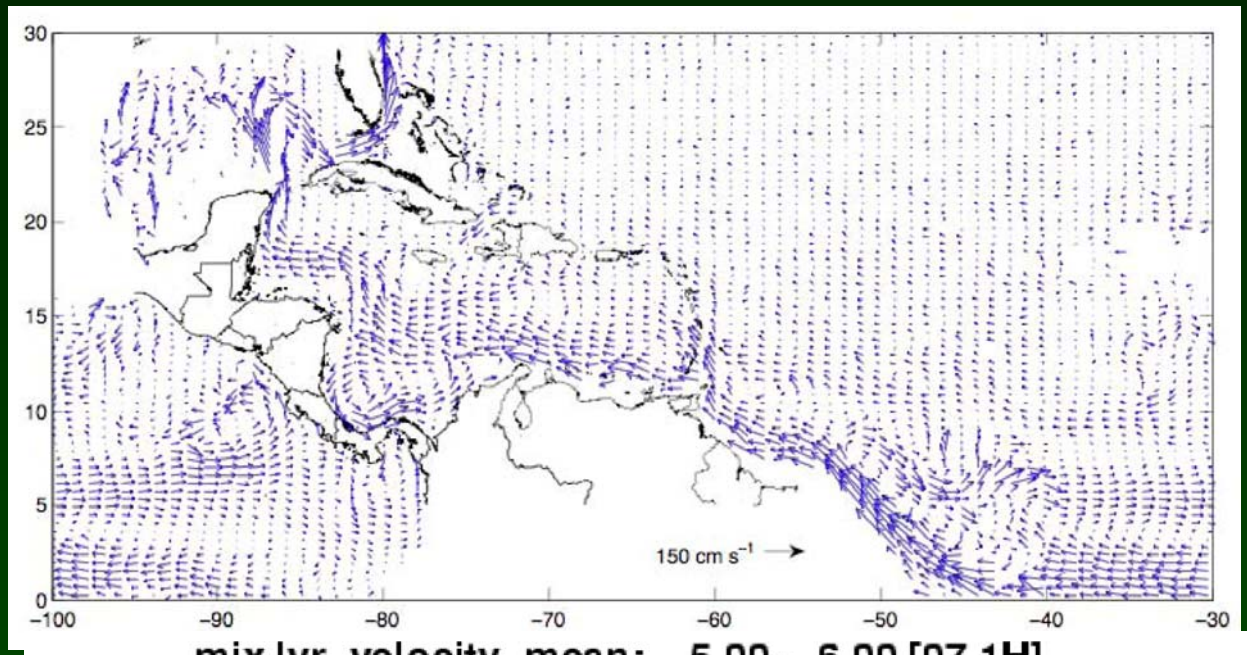


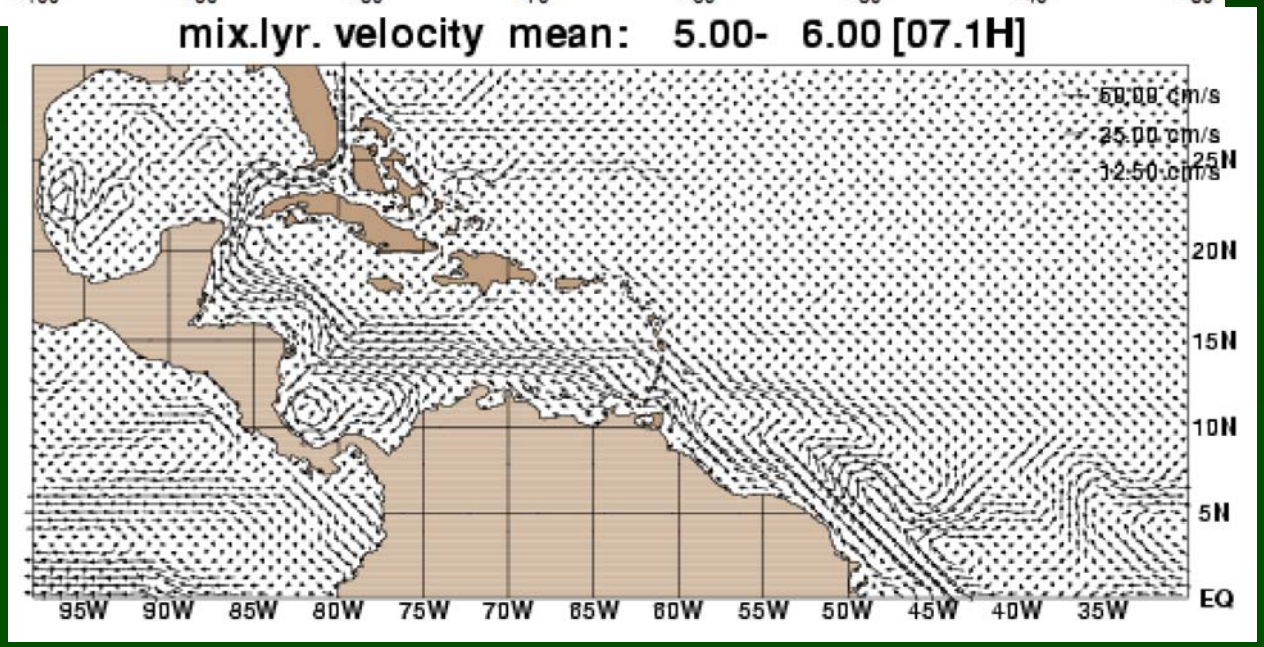
- Nested to HYCOM global 1/12◦ climatological run (NRL)
- 5m coastline. Depth merged from:
  - < 10 m – from DBDB2 2 min global topography
  - Elsewhere - interpolated topography from global HYCOM which has corrected Caribbean and Florida sills and passages.

Bathymetry (m)



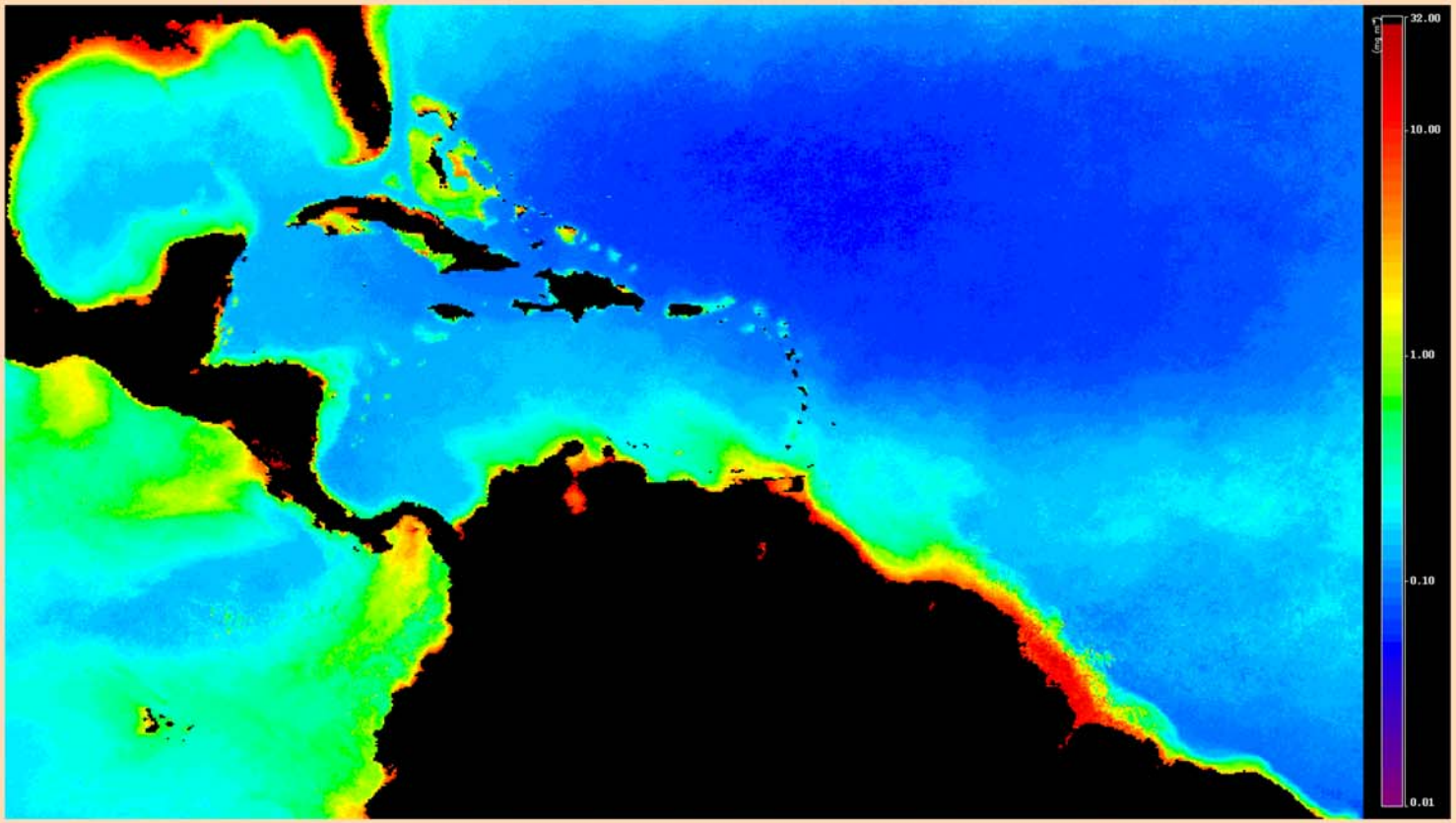
Obs. vs. HYCOM Mean Flow





Ocean Color (winter)

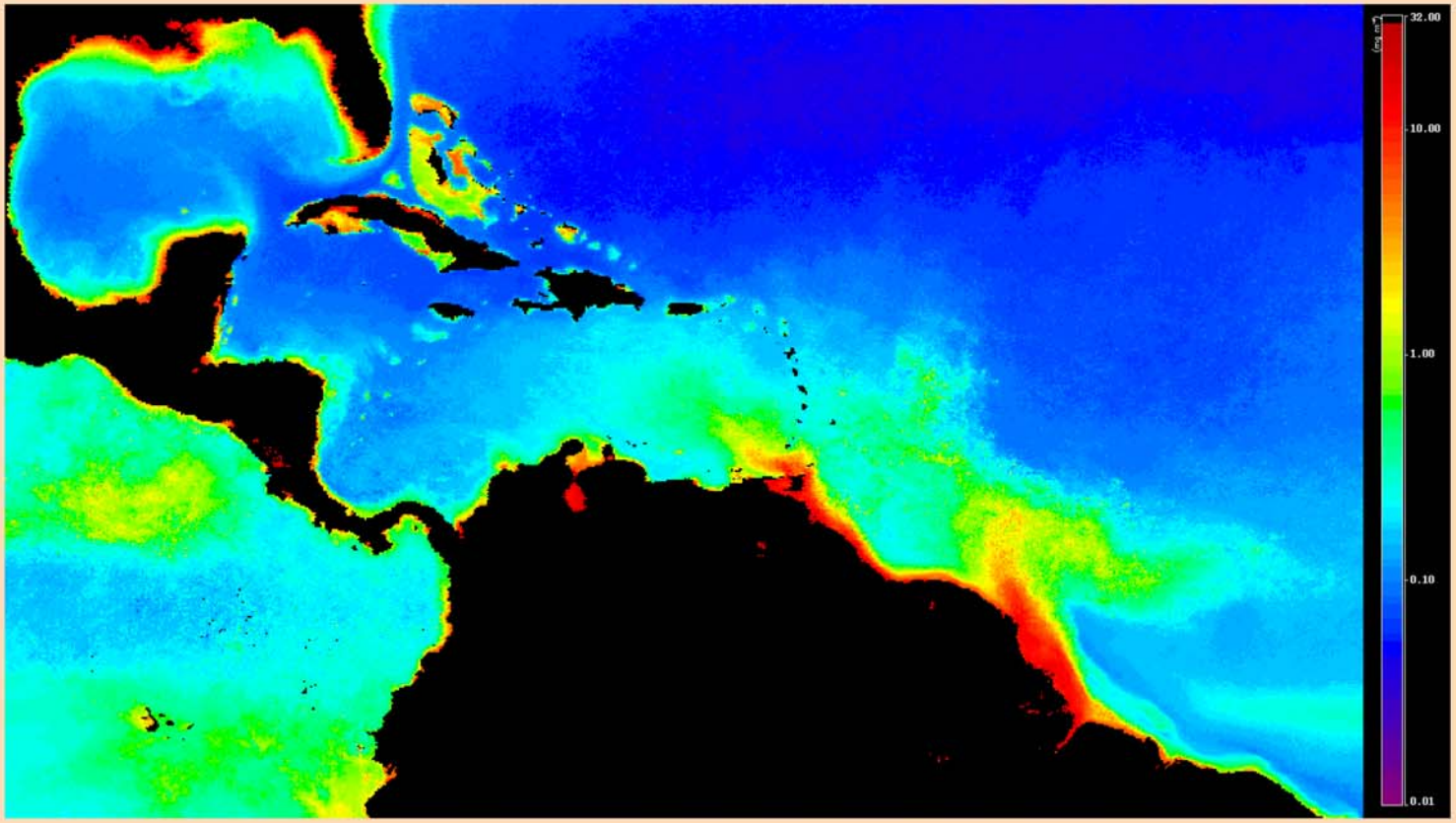
MODIS climatology – February (monthly mean)



Provided by Viva Benzon, RSMAS satellite group

Ocean Color (summer)

MODIS climatology – August (monthly mean)



Provided by Viva Benzon, RSMAS satellite group

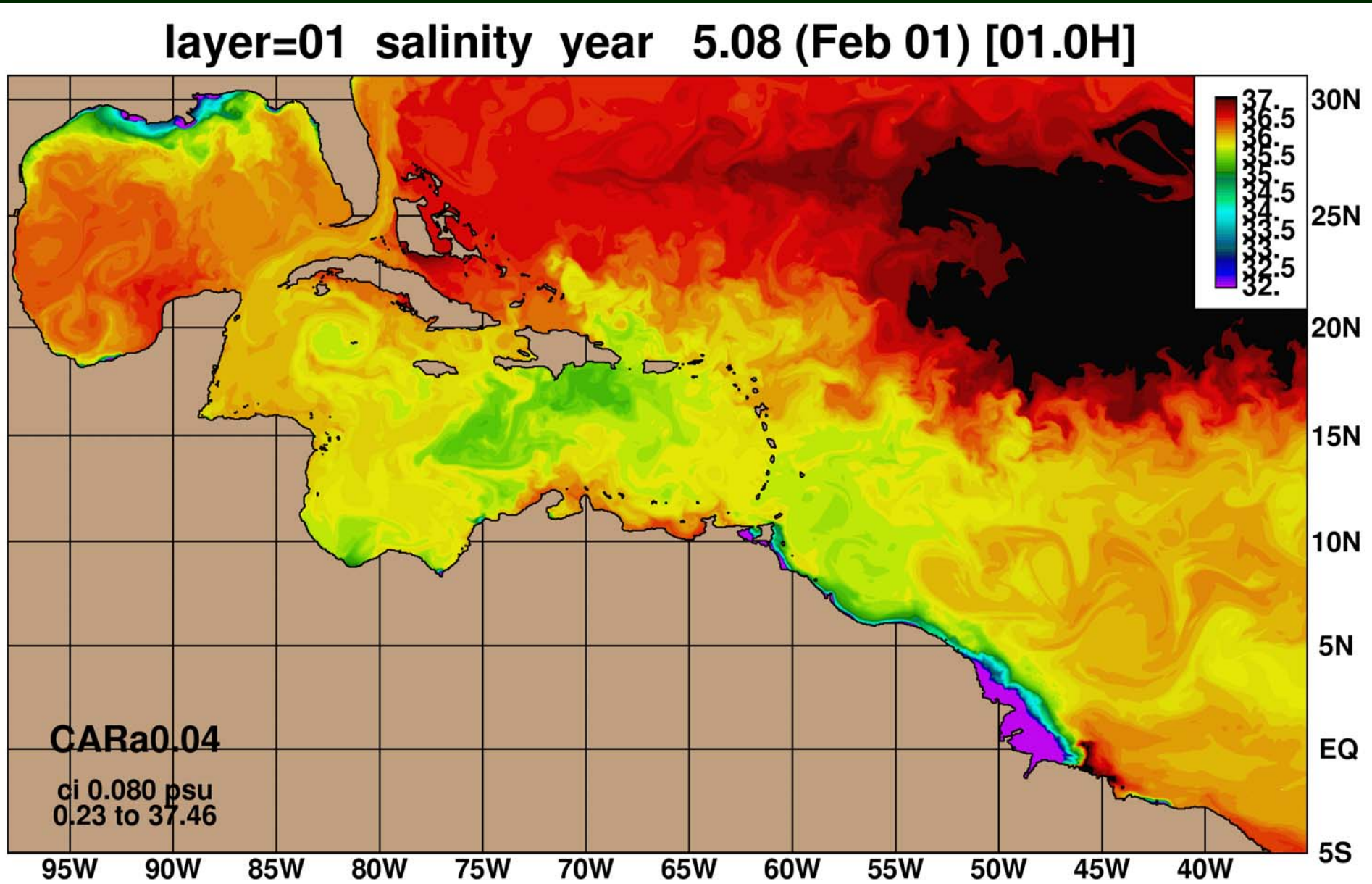
Initial Climatological Run (1)

- Run for one climatological year
- Nested within year 6 of a climatological global HYCOM simulation with 0.08° resolution
- Initial CARIB-HYCOM horizontal resolution of 0.04°

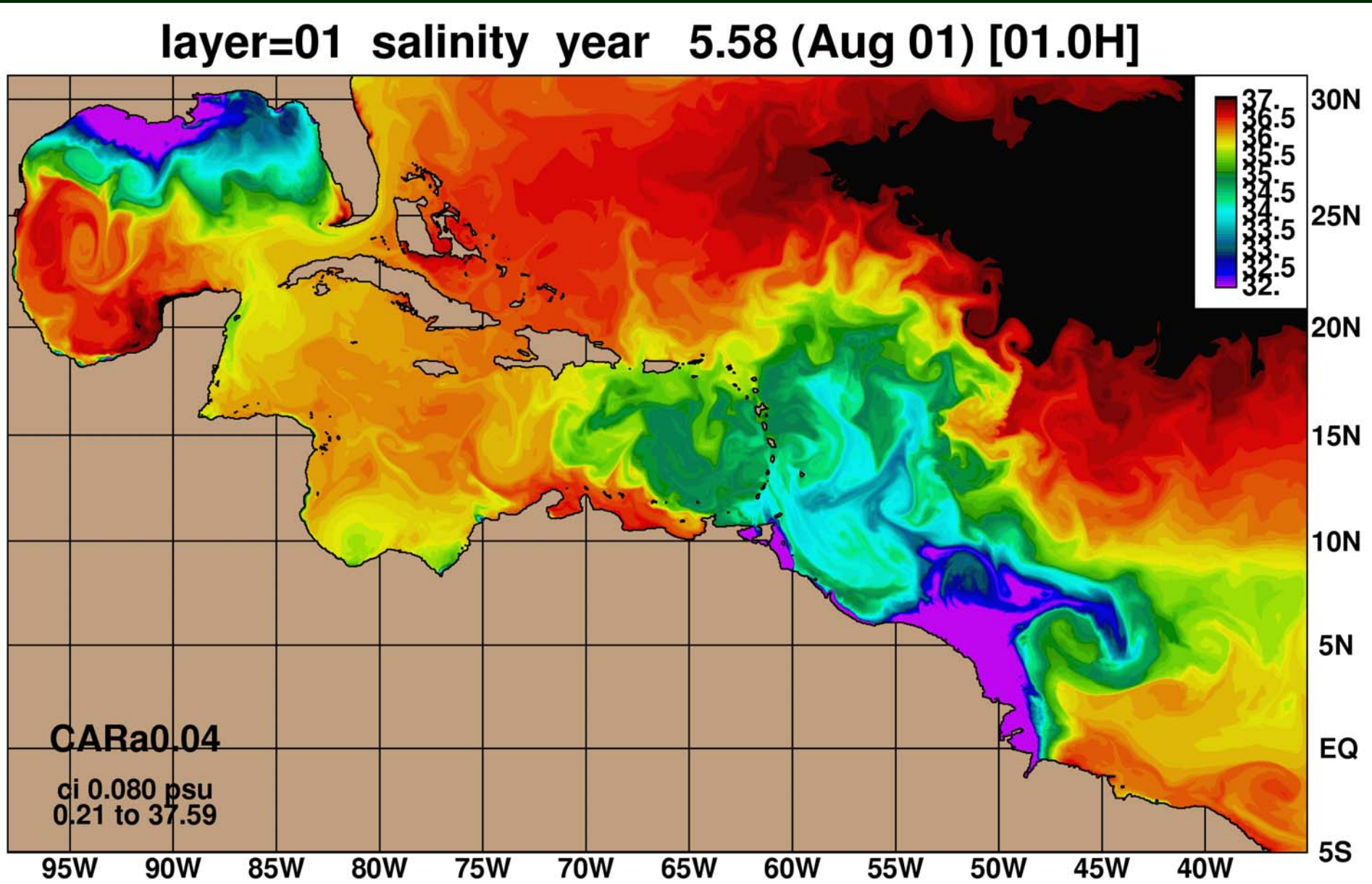
Initial Climatological Run (2)

- Vertical grid
  - σ_2^*
  - Same discretization as global HYCOM at NRL
- GISS vertical mixing
- Forcing – same as global model
  - Climatology from ERA 40, 1979-2002
    - Wind stress and speed
      - Climatology corrected by scatterometer
      - Representative NOGAPS 6-hr anomalies (year 2003) added
    - Precipitation
      - Climatology corrected by regression (GPCP)
  - Salinity relaxation to climatology (30 days)

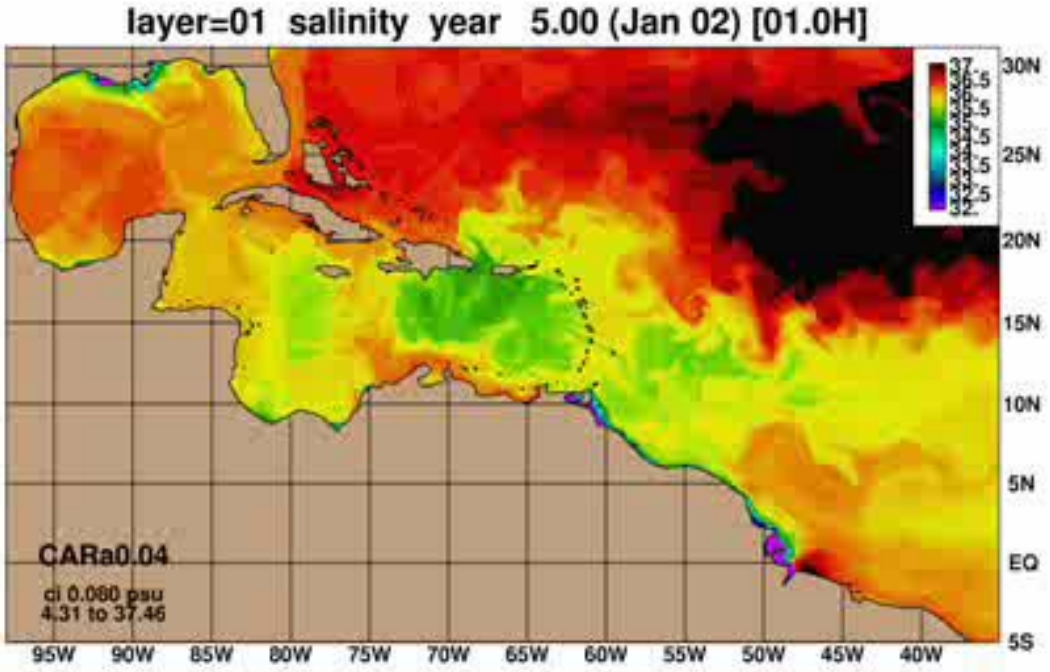
Salinity (winter)



Salinity (summer)



Salinity Animation (2 Jan. to 1 Aug.)



Interannual T Difference