The 1/12º global HYCOM real-time nowcast/forecast system

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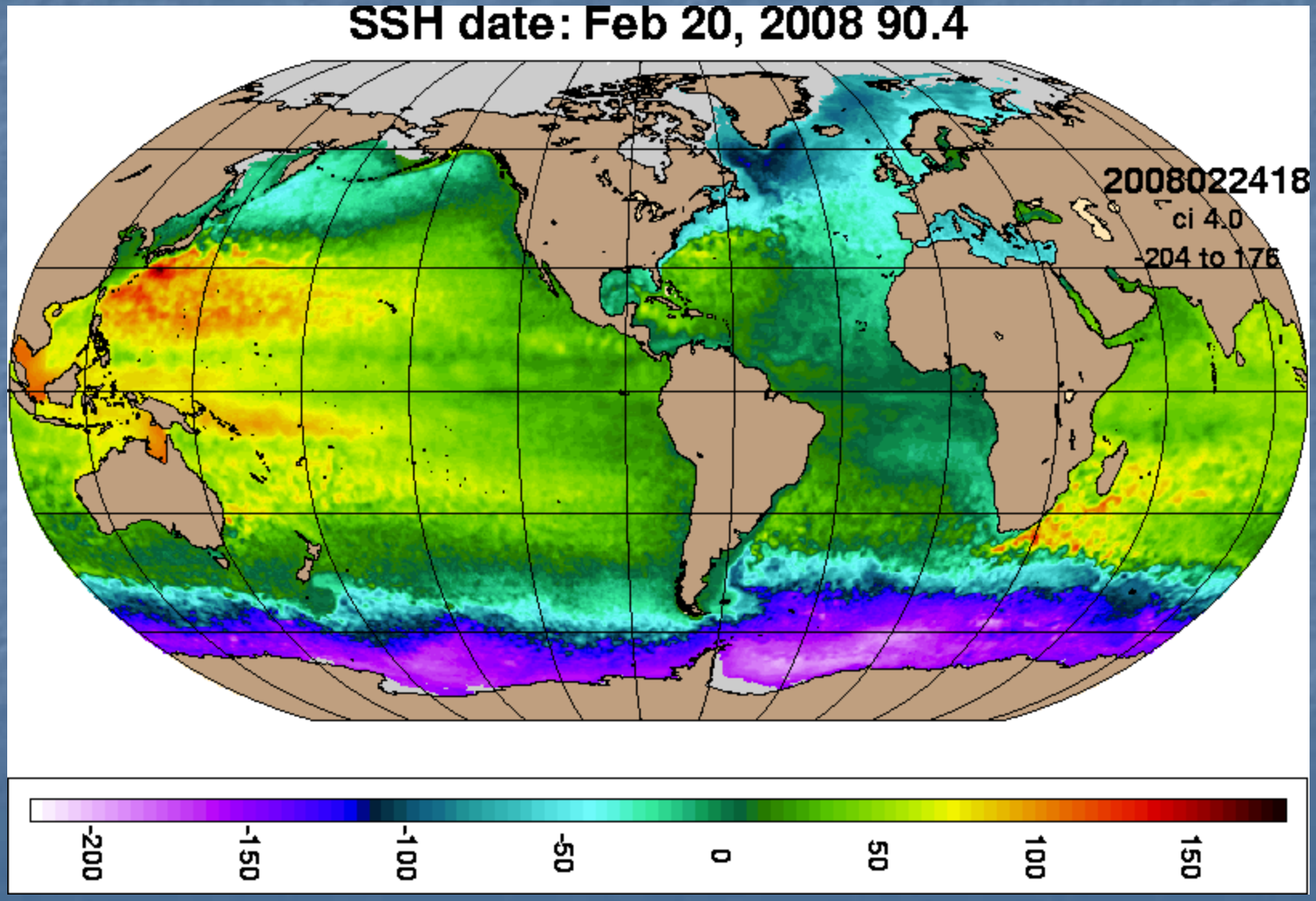
1/12º Global HYCOM Configuration

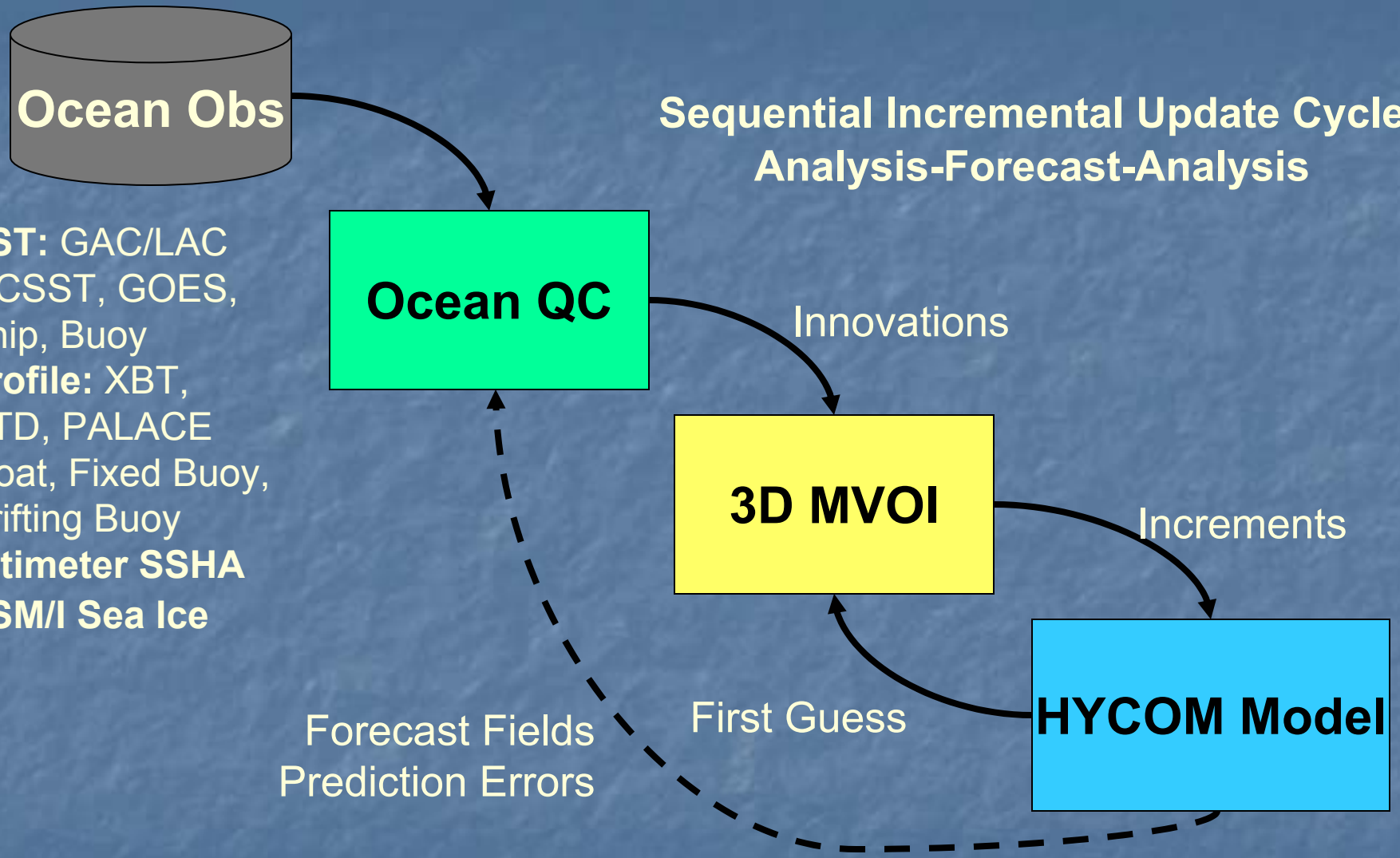
- Horizontal grid: 1/12° equatorial resolution
  - 4500 x 3298 grid points, ~6.5 km spacing on average, ~3.5 km at pole
- Mercator 79°S to 47°N, then Arctic dipole patch
- Vertical coordinate surfaces: 32 for σ_2*
- KPP mixed layer model
- Thermodynamic (energy loan) sea-ice model
- Surface forcing: **FNMOC NOGAPS 0.5°** wind stress, wind speed, thermal forcing, and **NOGAPS 1.0°** precipitation
- Monthly river runoff (986 rivers)
- Initialize from January climatology (GDEM3) T and S, then SSS relaxation from PHC 3.0
  - No subsurface relaxation to climatology

1/12º Global HYCOM

Real time run started 22 December 2006



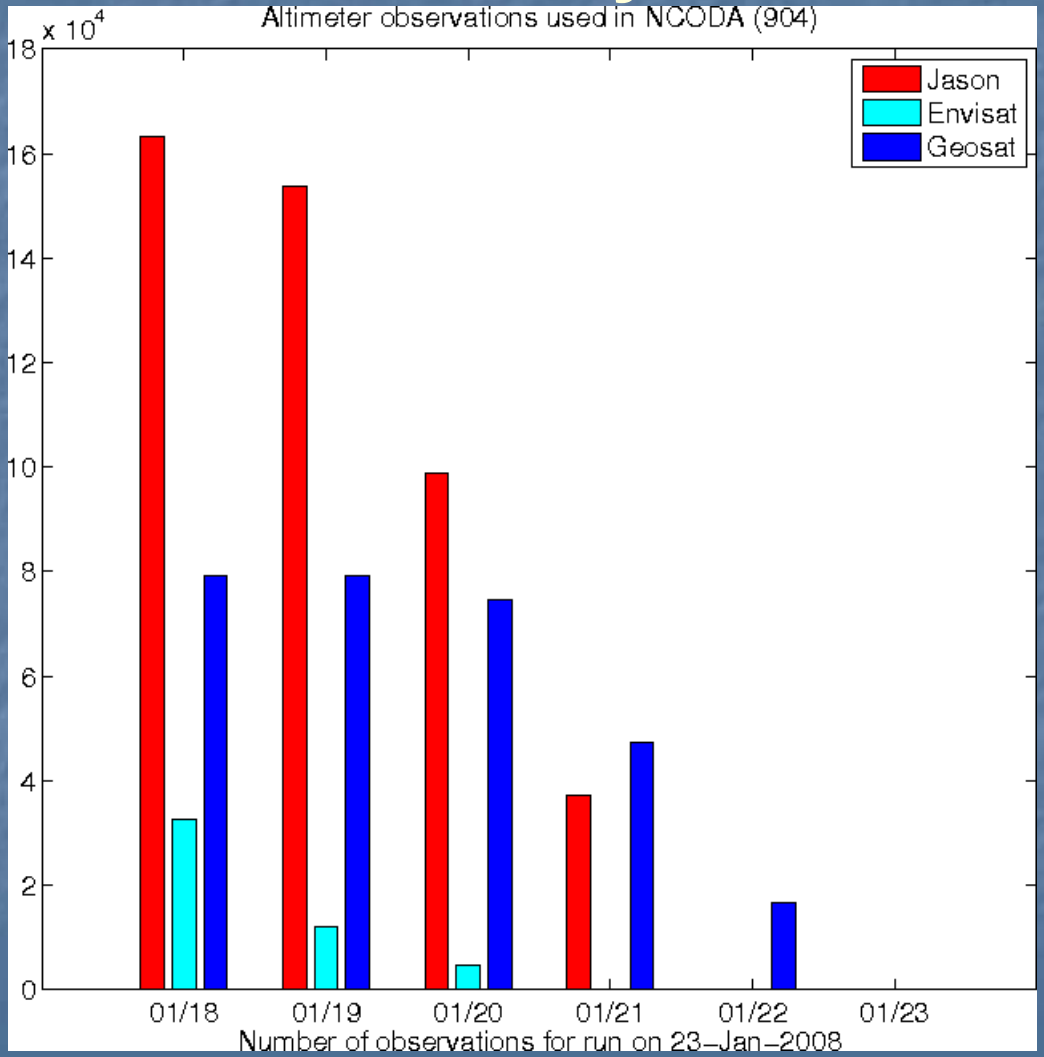
Navy Coupled Ocean Data Assimilation (NCODA)



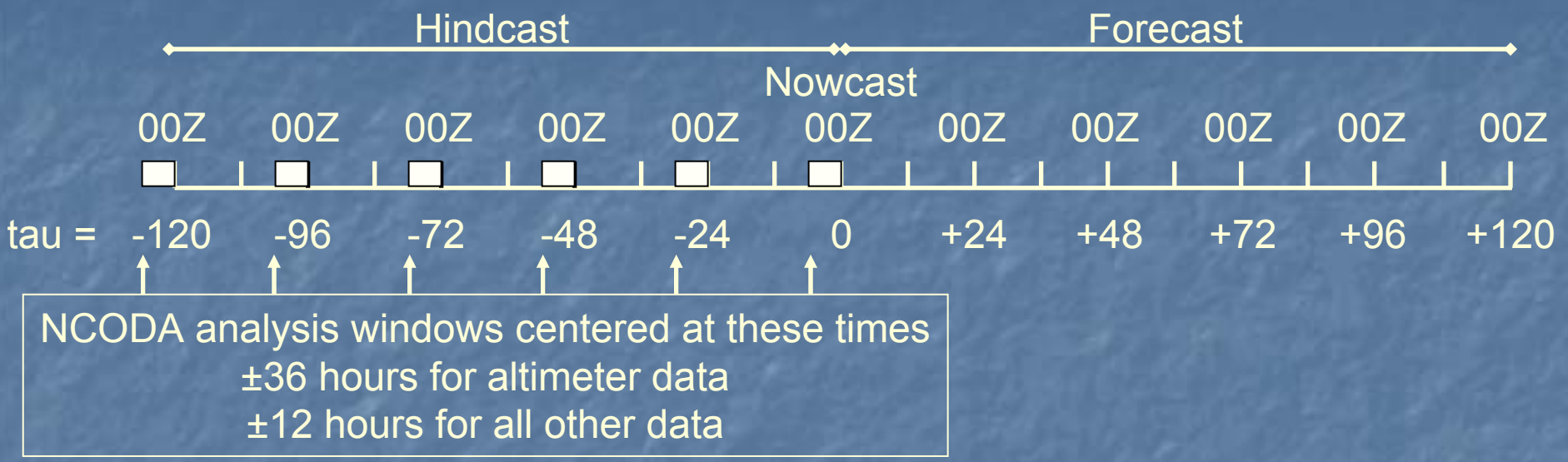
MVOI - simultaneous analysis 6 ocean variables temperature, salinity, geopotential, layer pressure, velocity (u,v)

Available altimeter data

23 January 2008



HYCOM/NCODA Runstream



1) Perform first NCODA analysis centered on tau = -126
2) Run HYCOM for 24 hours using incremental updating (▭) over the first 6 hrs
3) Repeat steps 1) and 2) until the nowcast time
4) Run HYCOM in forecast mode out to tau = 120

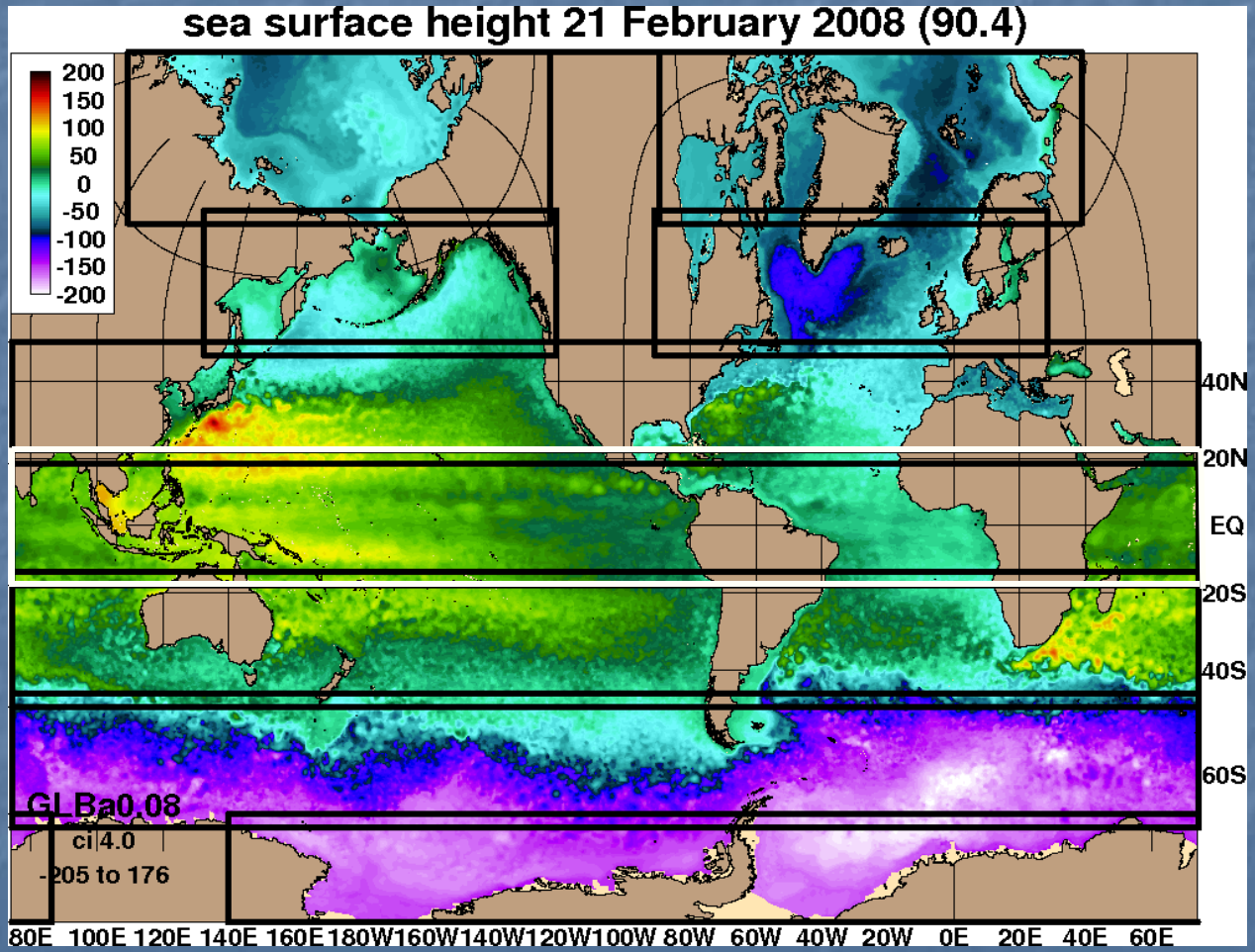
Approximate run times* (using 379 IBM Power 5+ processors):

1) Six NCODA analyses: 1.1 hrs/analysis = 6.6 hrs
2) Five HYCOM hindcast days @ 240 sec Δt: 0.8 hrs/day = 4.0 hrs
3) Five HYCOM forecast days @ 240 sec Δt: 0.8 hrs/day = 4.0 hrs
4) Total: 14.6 hrs

* Timings do not include PIPS coupling

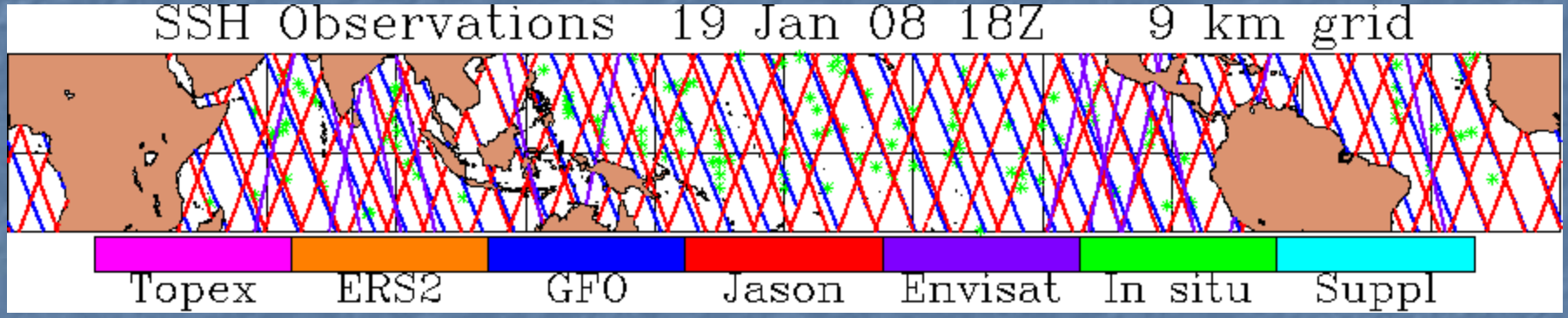
Data Assimilation Subregions

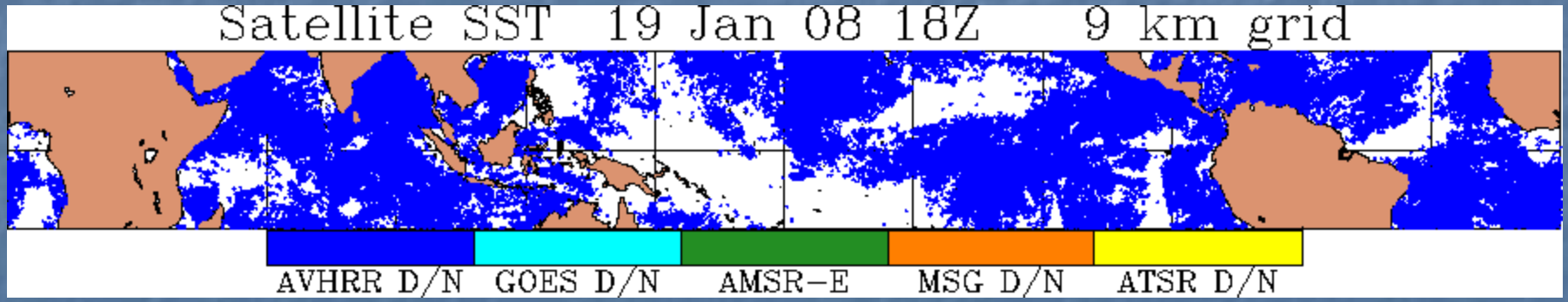
Overlaid on SSH valid on 21 February 2008



NCODA Observation Locations

19 January 2008





NCODA Observation Locations

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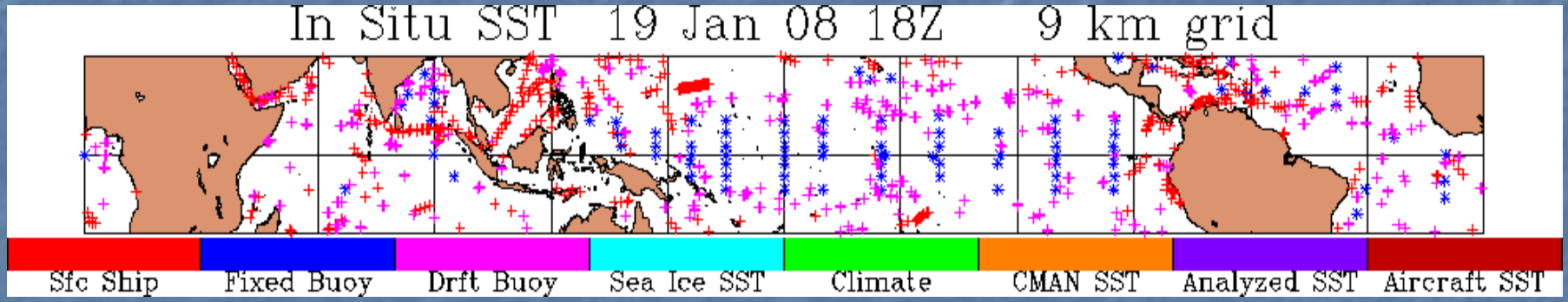
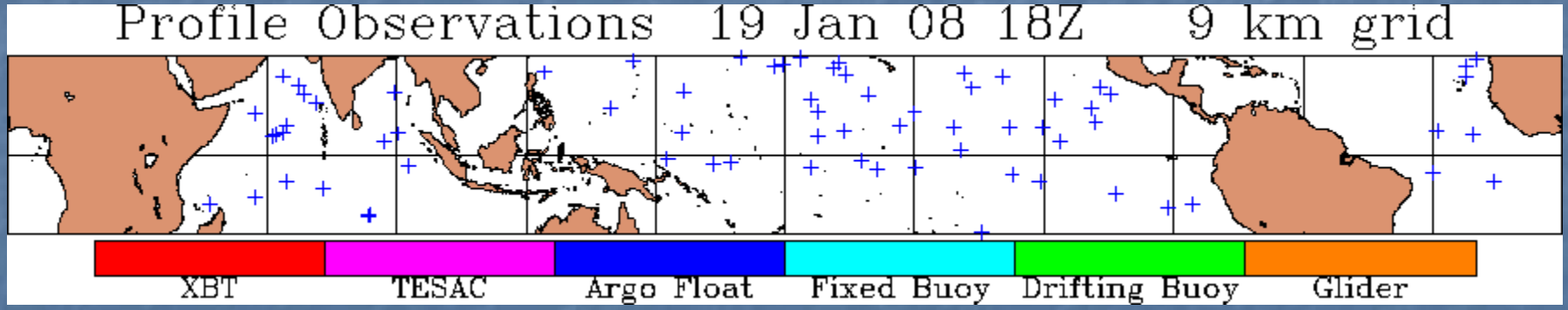
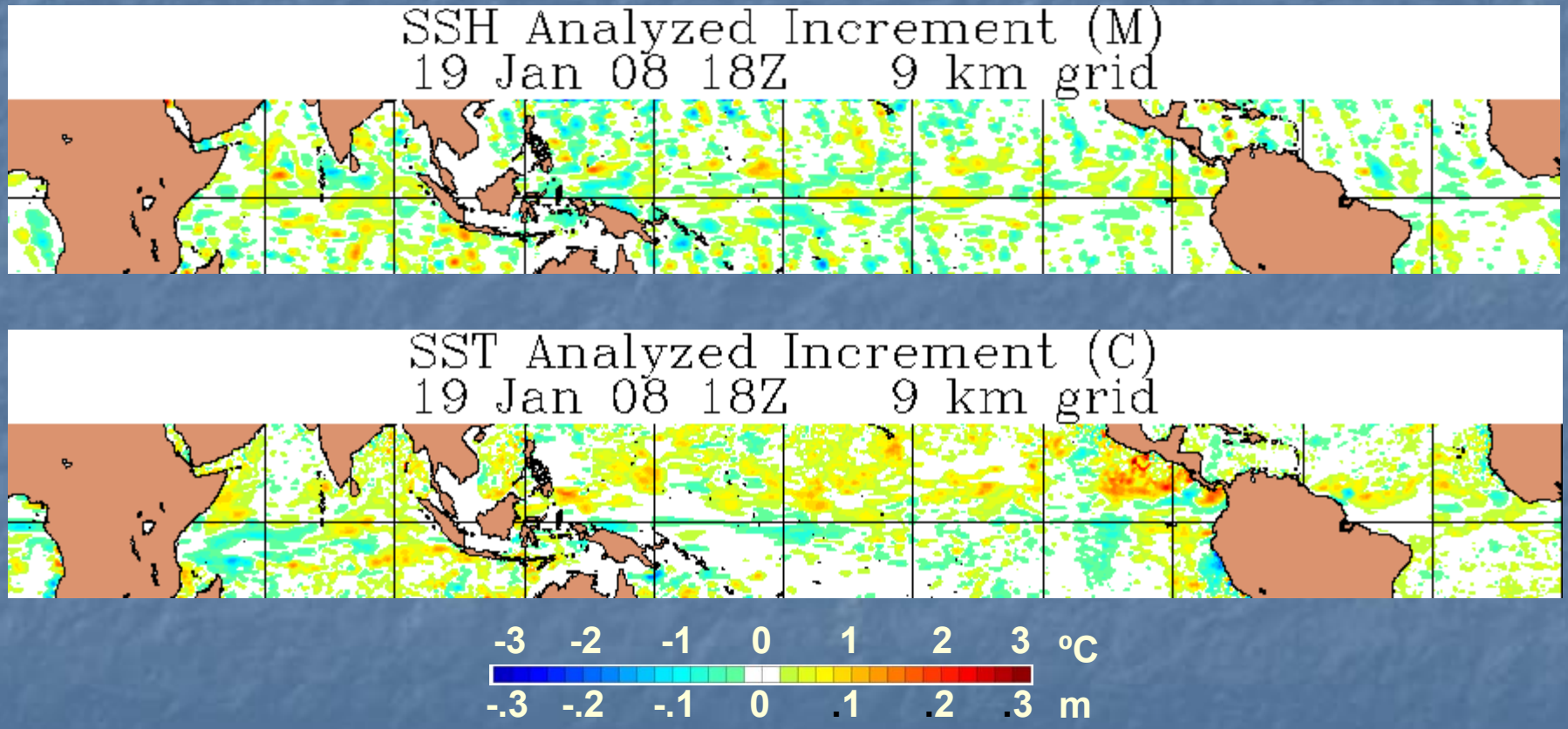




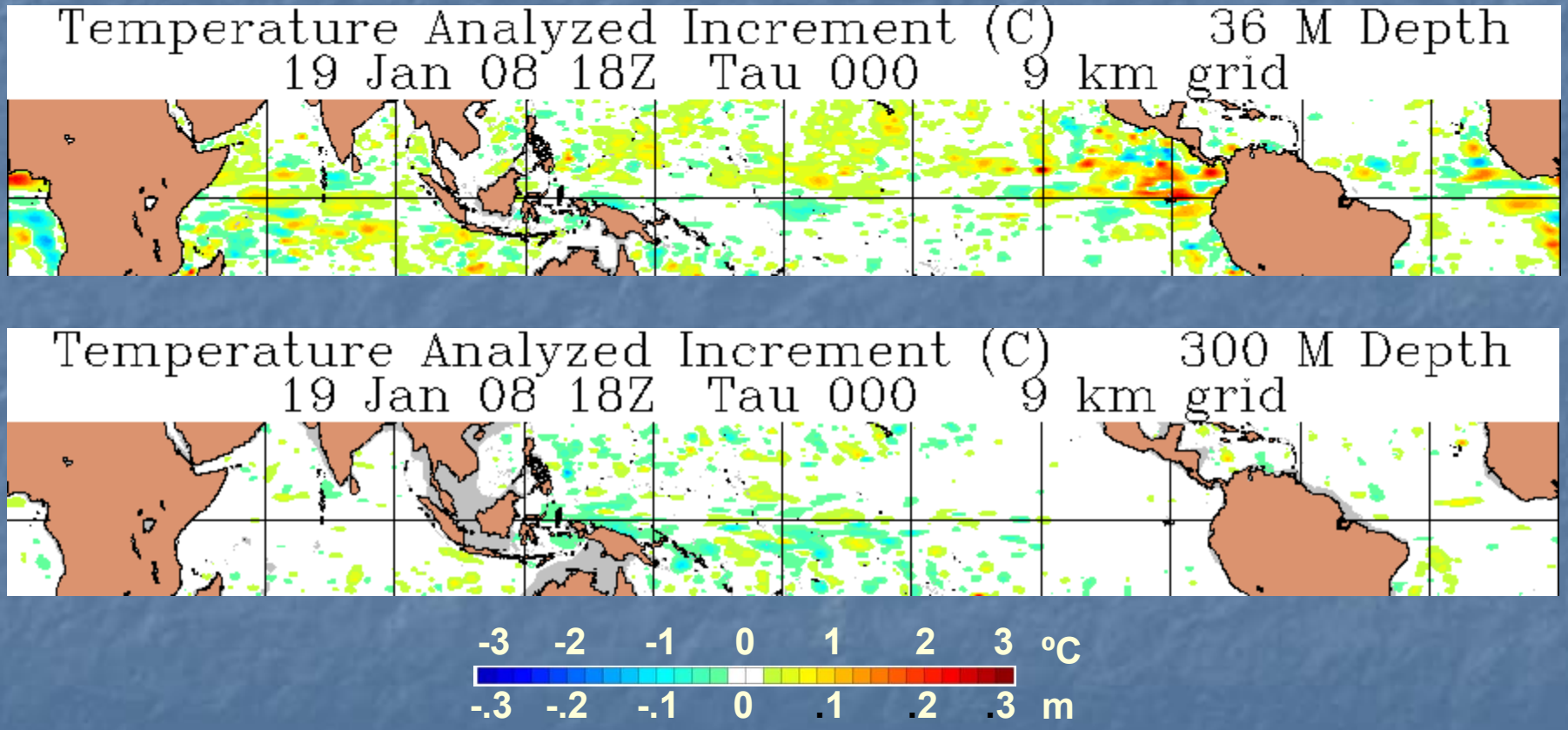
Sea Surface Height and Sea Surface Temperature Increments

19 January 2008



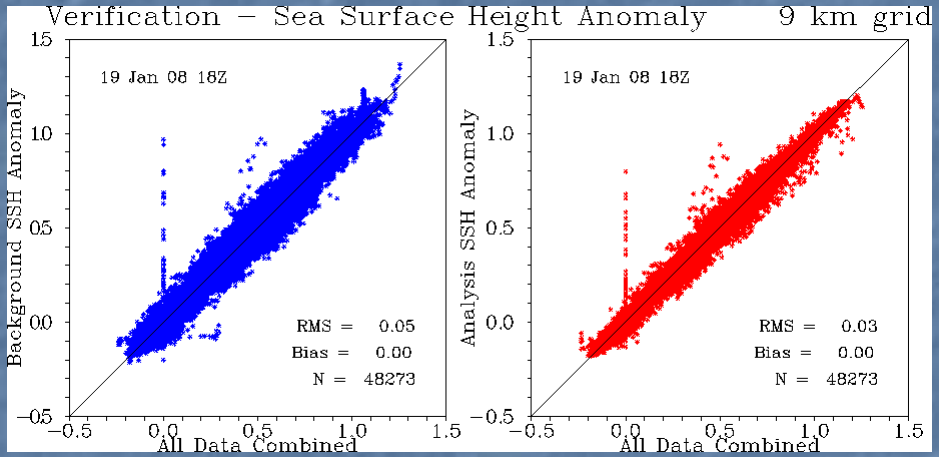
Temperature Increments

19 January 2008

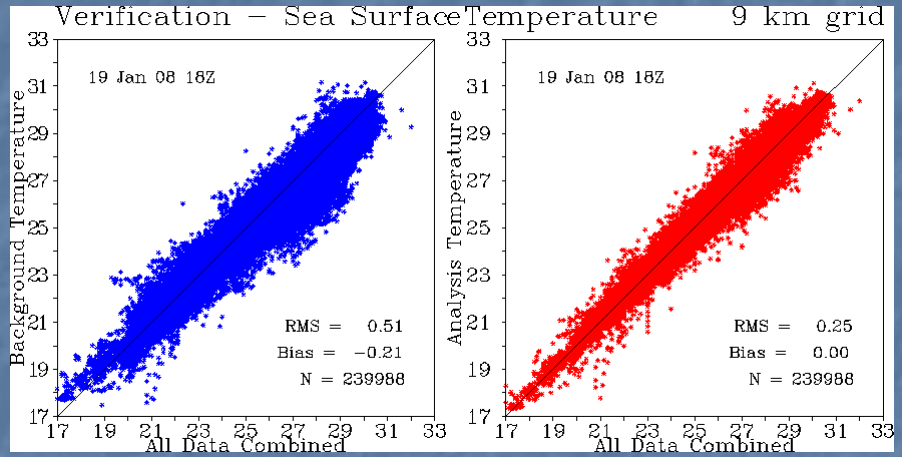


NCODA verification

SSH verification



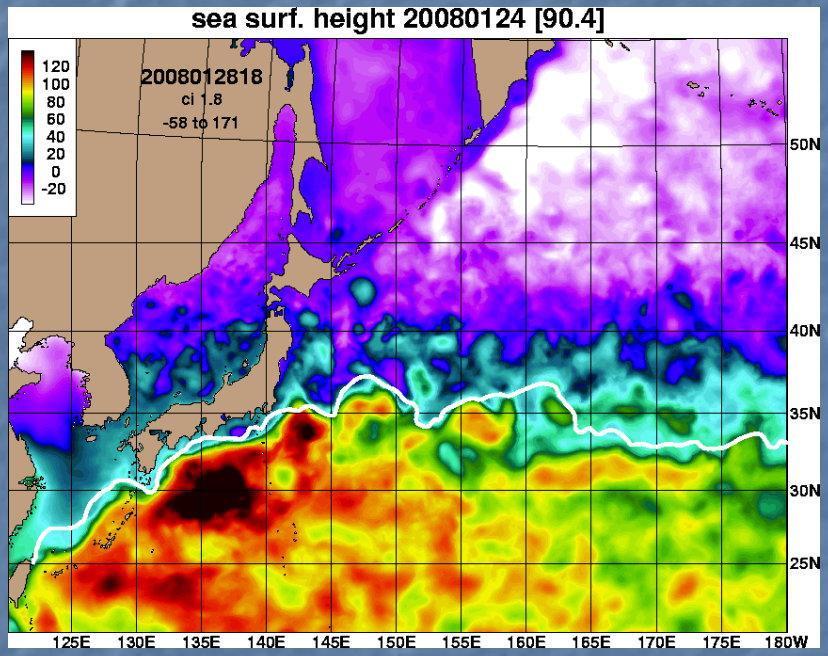
SST verification



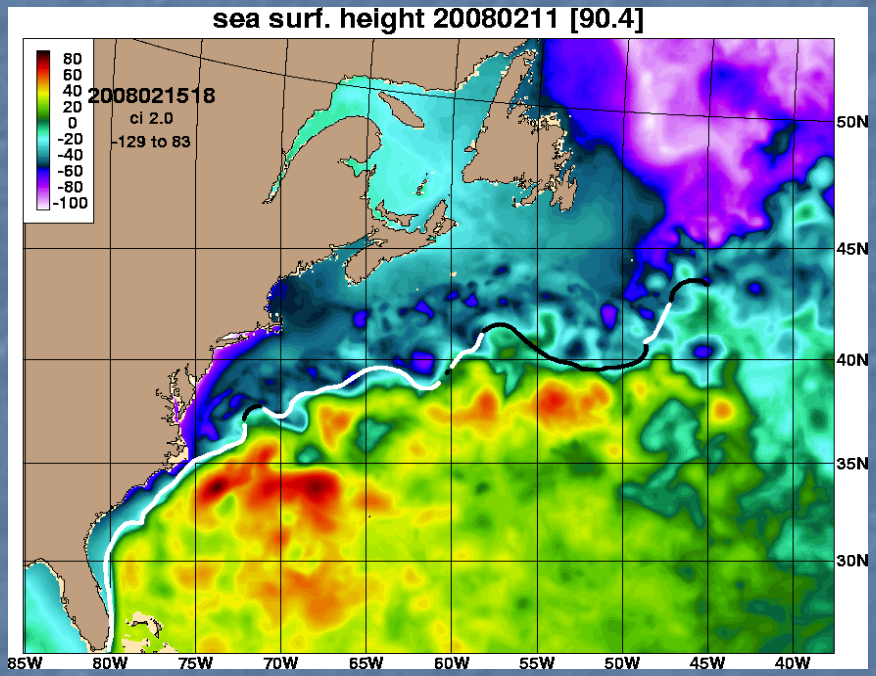
Data Assimilation in Global HYCOM

Gulf Stream and Kuroshio SSH with SST-based frontal analysis overlaid

24 January 2008



2 February 2008

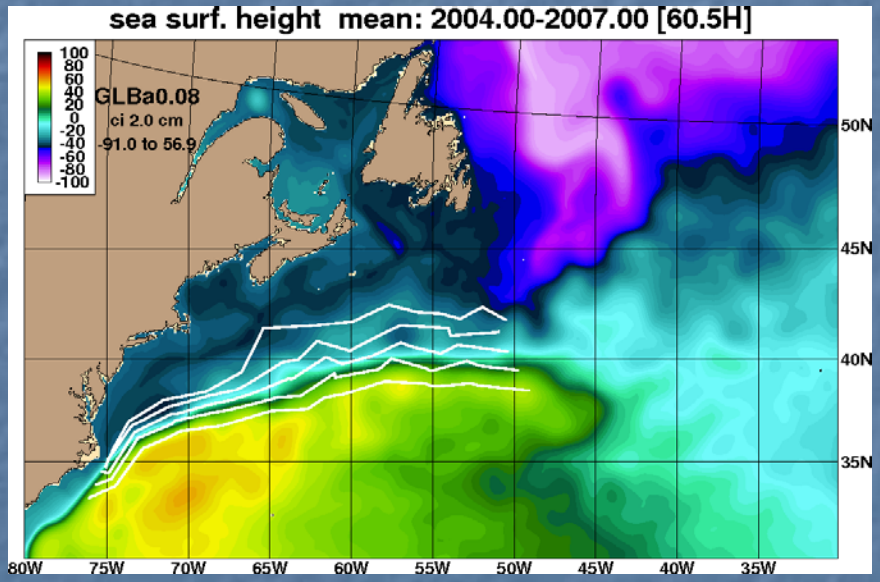


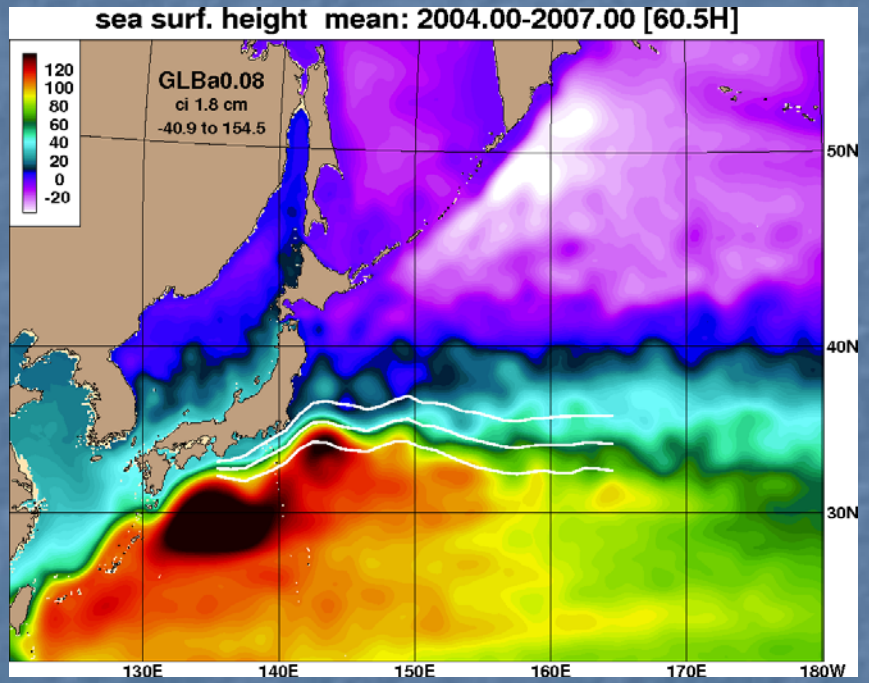
Frontal analysis < 4 days old = white,
analysis ≥ 4 days old = black

1/12º Global HYCOM

2004-2006 Mean SSH

Gulf Stream and Kuroshio region

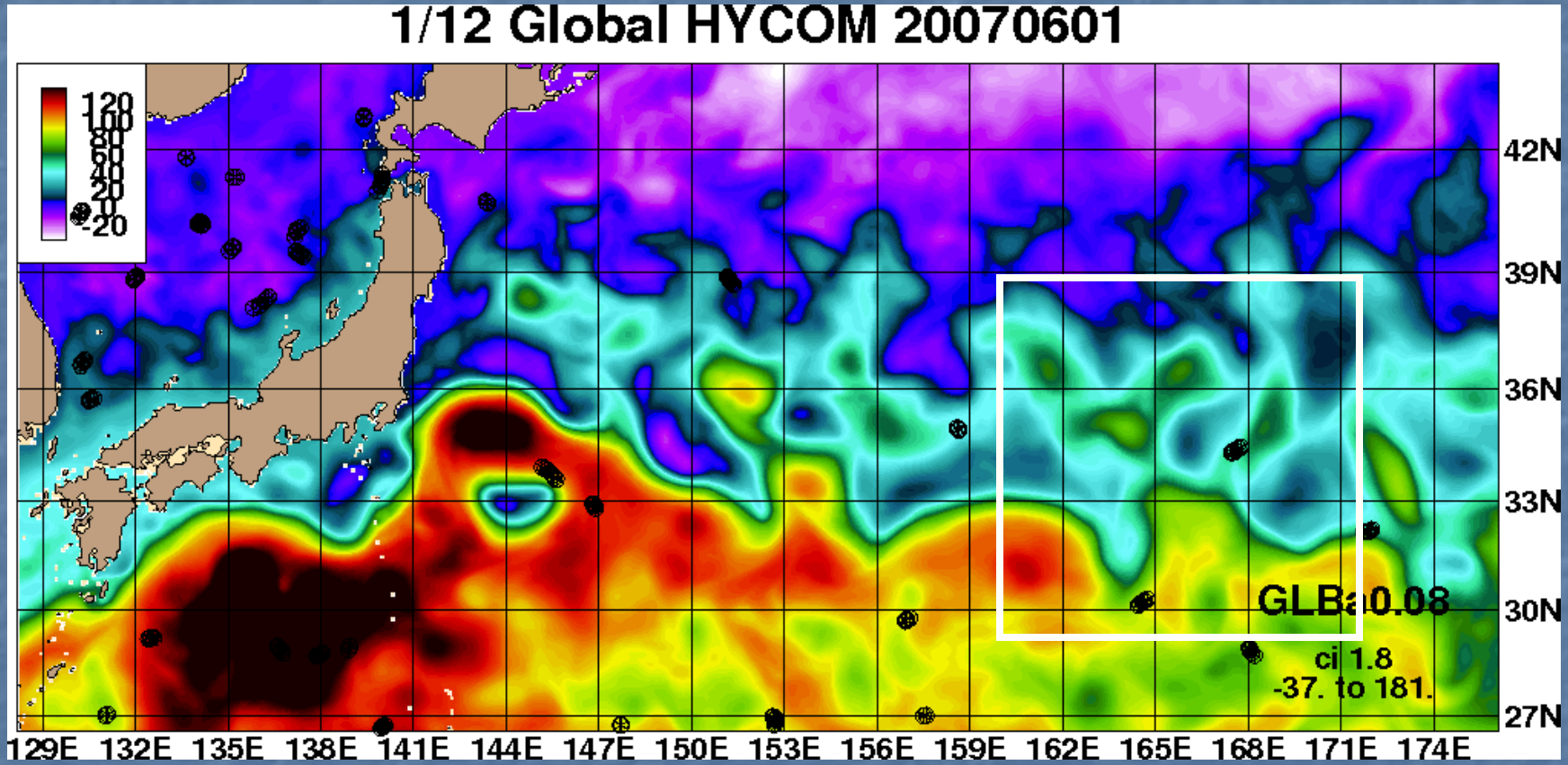




White lines are the mean position and +- 1 stdv

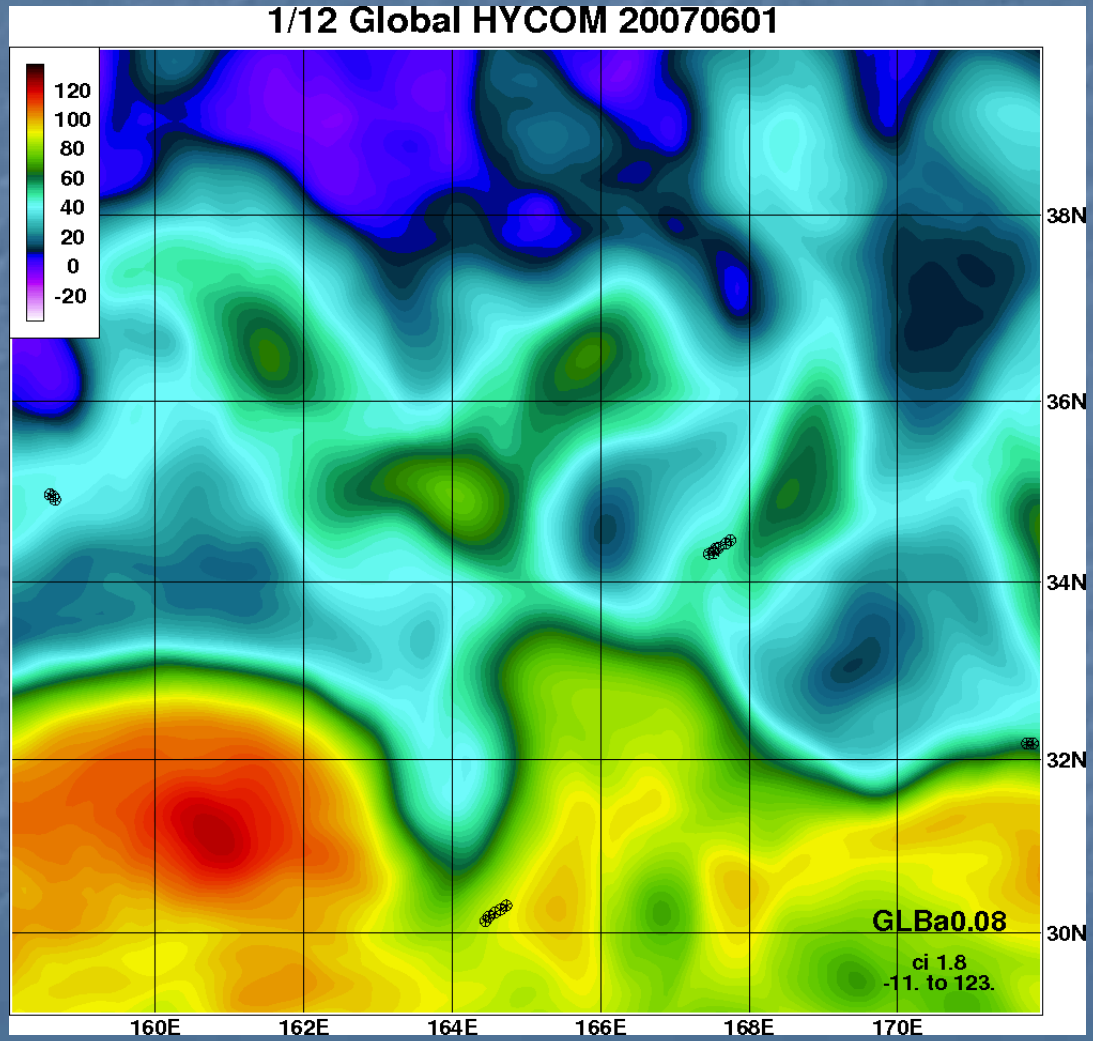
1/12º Global HYCOM

SSH and surface drifters



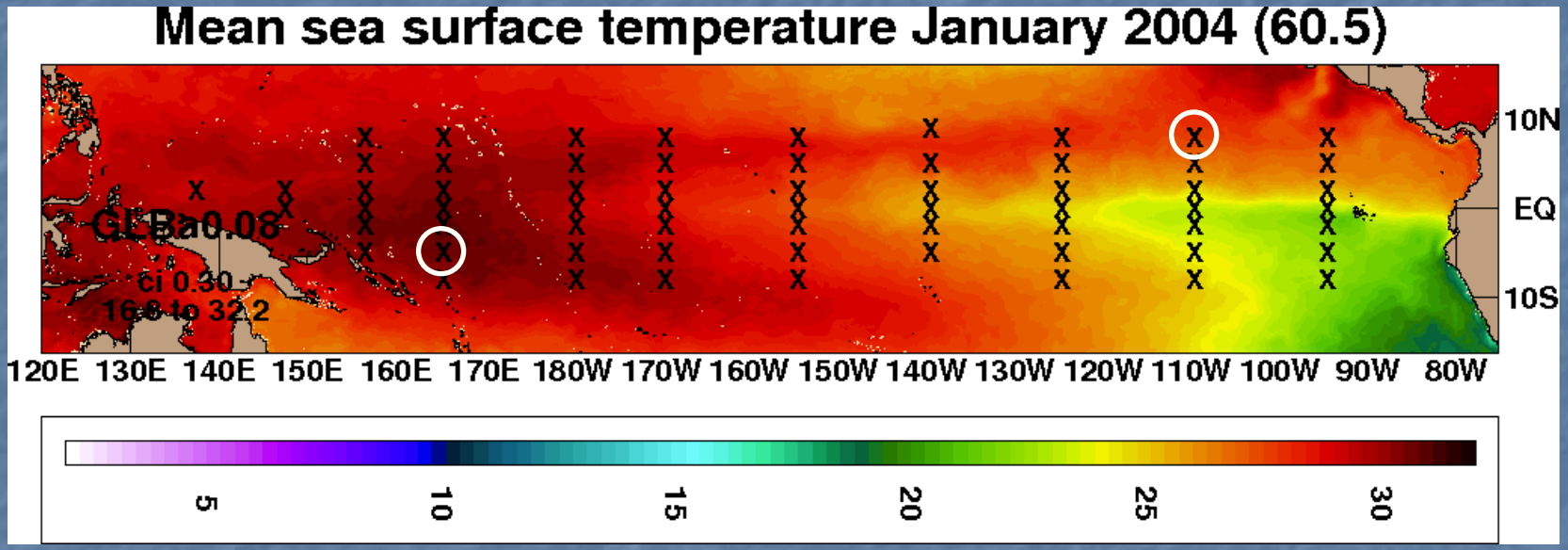
1/12º Global HYCOM

SSH and surface drifters



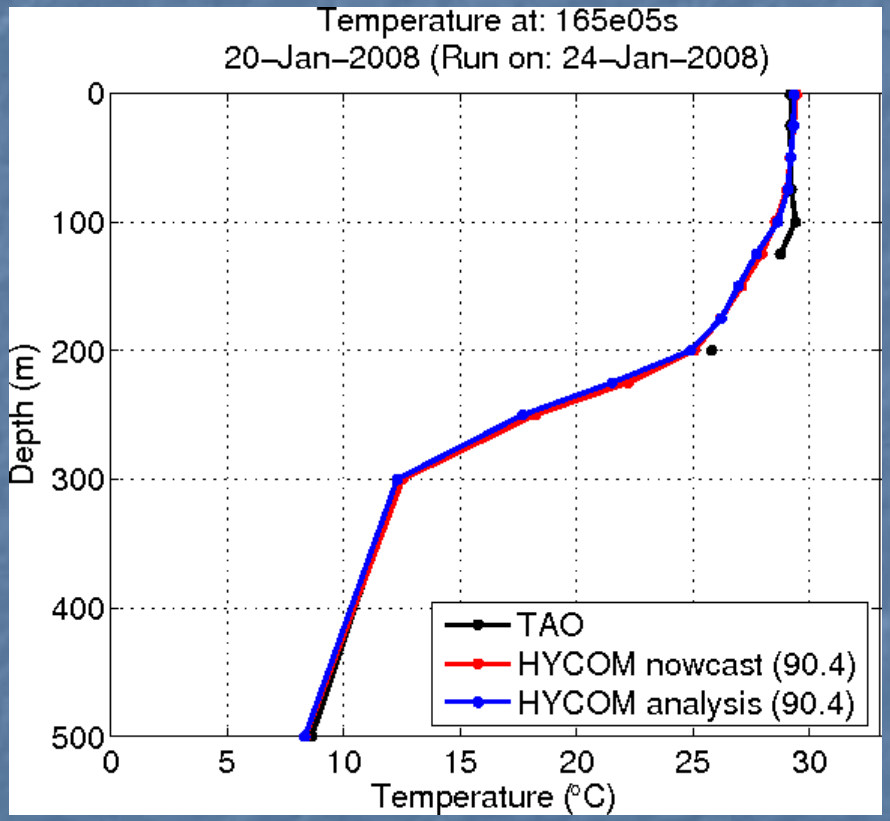
Vertical Temperature Profiles

Locations of TAO buoys



Vertical temperature profiles

5ºS 165ºE



8ºN 110ºW