ATMOSPHERIC FORCING ISSUES

NEAR LAND/SEA BOUNDARIES

By

A. BIROL KARA, ALAN J. WALLCRAFT, AND HARLEY E. HURLBURT

Naval Research Laboratory (NRL)

Stennis Space Center

Introduction and Motivation

- "Coarse" resolution atmospheric forcing:
  - ECMWF ($1.125° \times 1.125°$)
  - NCEP ($1.875° \times 1.875°$)
  - NOGAPS ($1.0° \times 1.0°$)
- "Fine" resolution HYCOM
  - $1/12°$ Pacific model
  - $1/25°$ Black Sea model
  - $1/37.5°$ Gulf of California

- PROBLEM

Coarse resolution atmospheric products

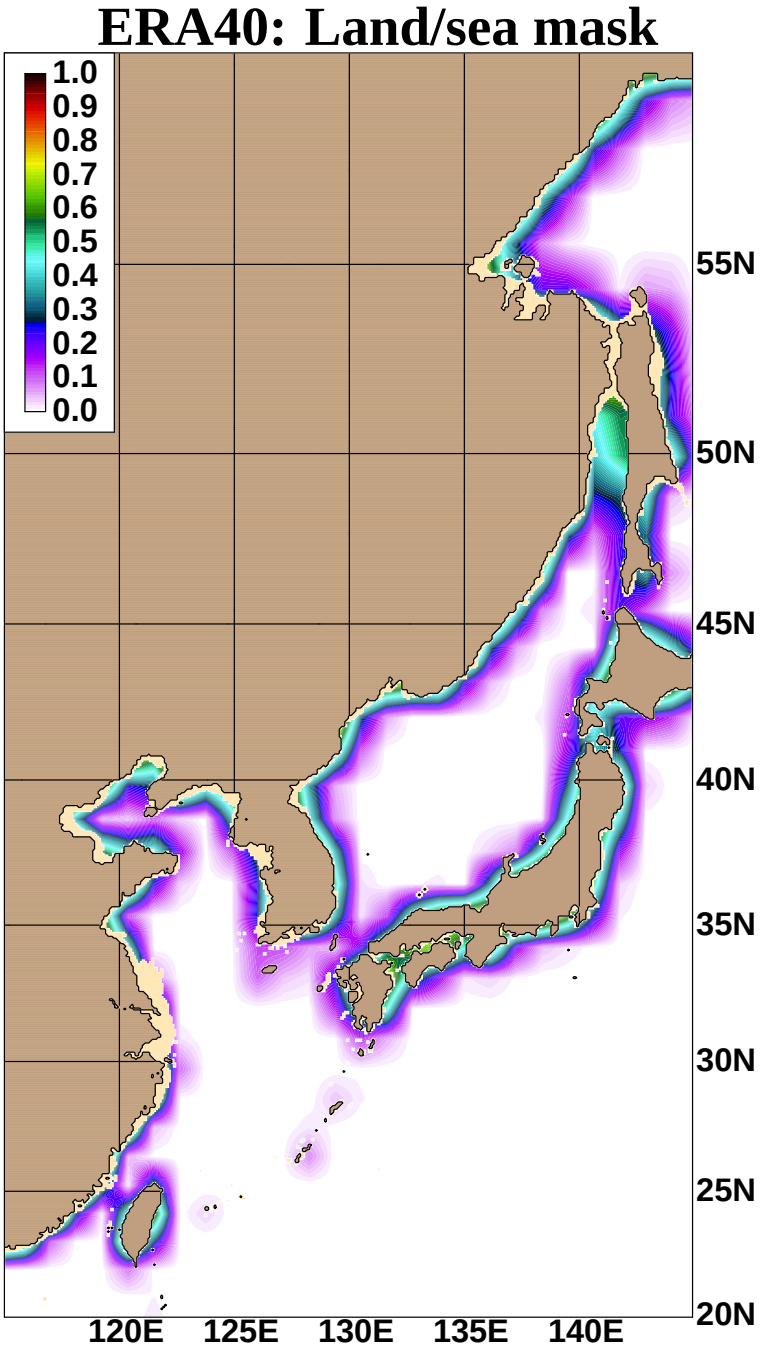
in forcing much finer OGCMs, such as HYCOM

Specific Issues

- Interpolation to HYCOM domain
- Land/sea boundary near the coastal regions:
  - atmospheric forcing contaminated by land values
  - ocean grid misrepresentation near the coast
- HYCOM needs **only over–ocean** atmospheric condition

Land/Sea Mask

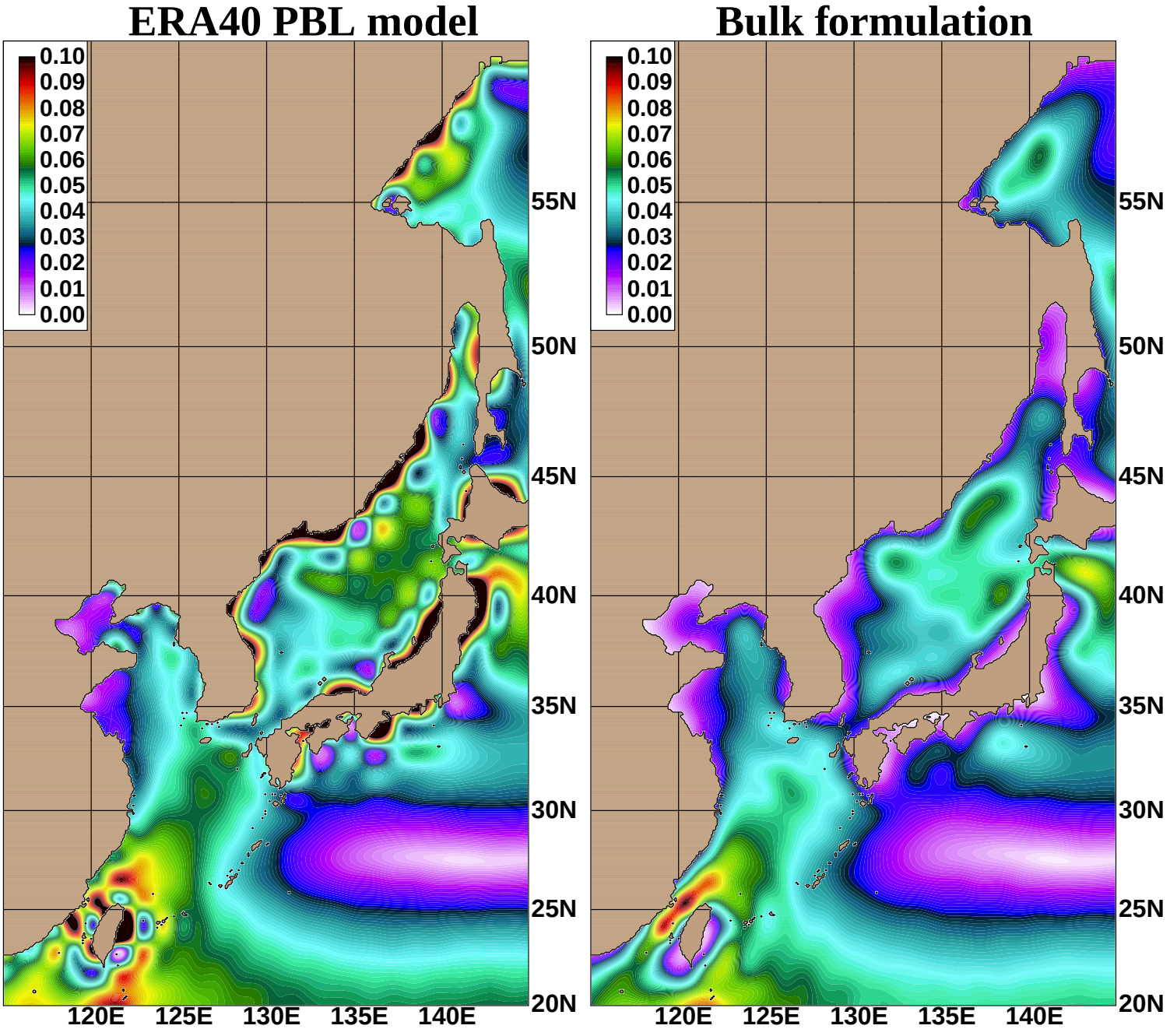
- Model surfaces are divided into sea (0) and land (1) point
- Land: if more than 50% of the grid box is on the land



Wind Forcing

- Elimination of excessive noise and incorrect data
- Use bulk formulation with ERA40 wind speed

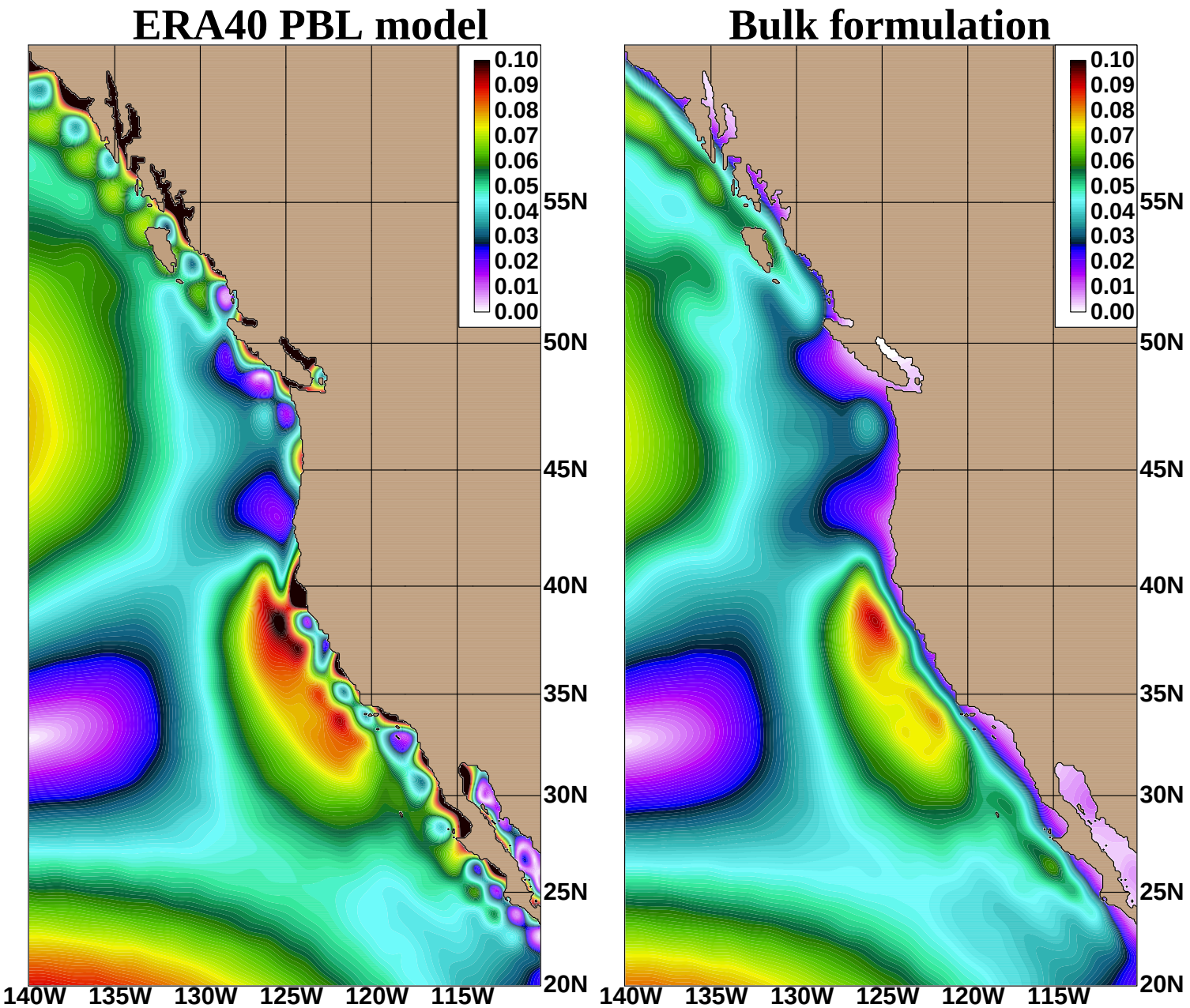
WIND STRESS MAGNITUDE (N m^{-2}): 1979–93 mean



Another example: U.S. West Coast

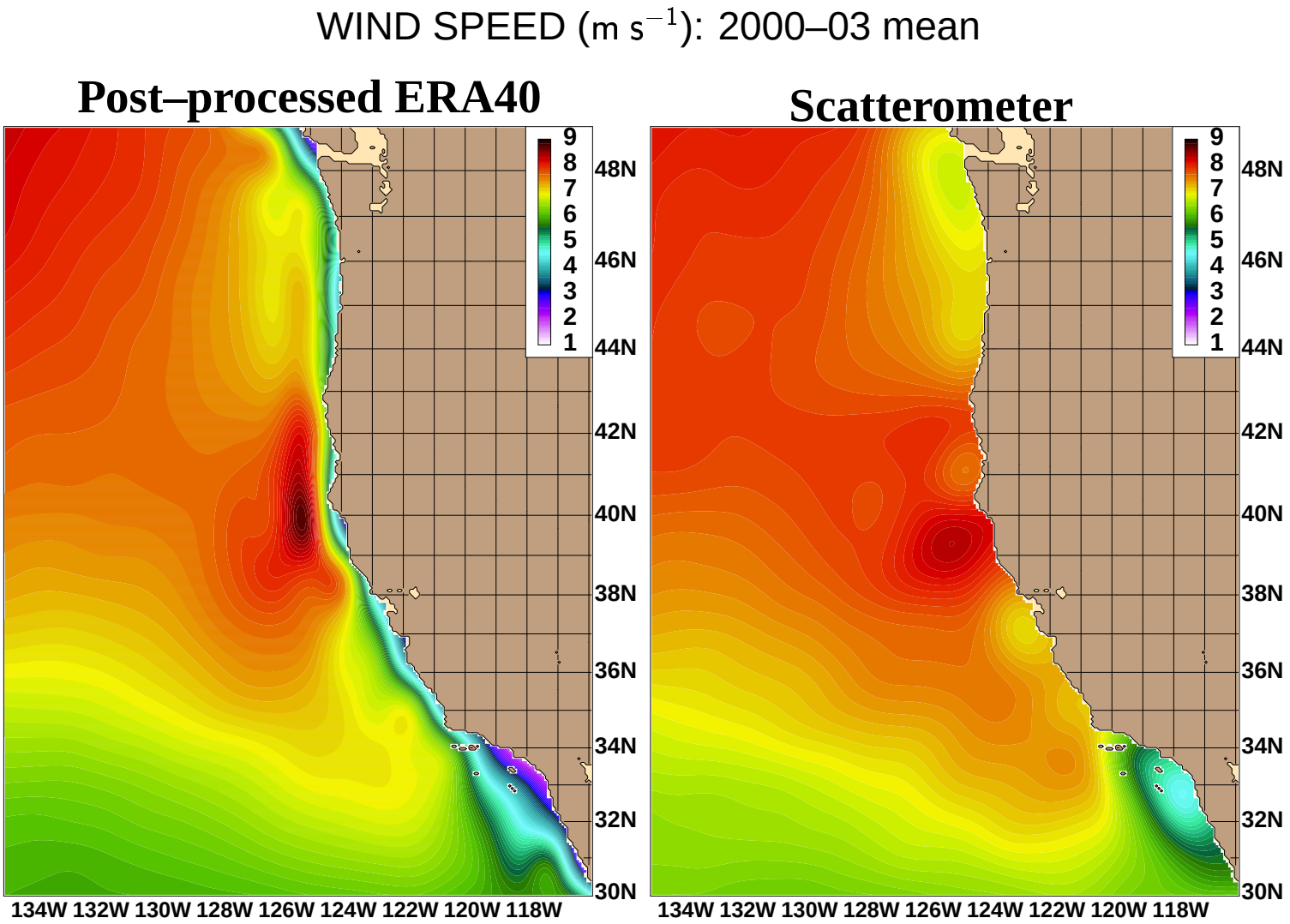
- Strong winds and upwelling near the coast

WIND STRESS MAGNITUDE (N m^{-2}): 1979–93 mean



Wind Speed near the California Coast:

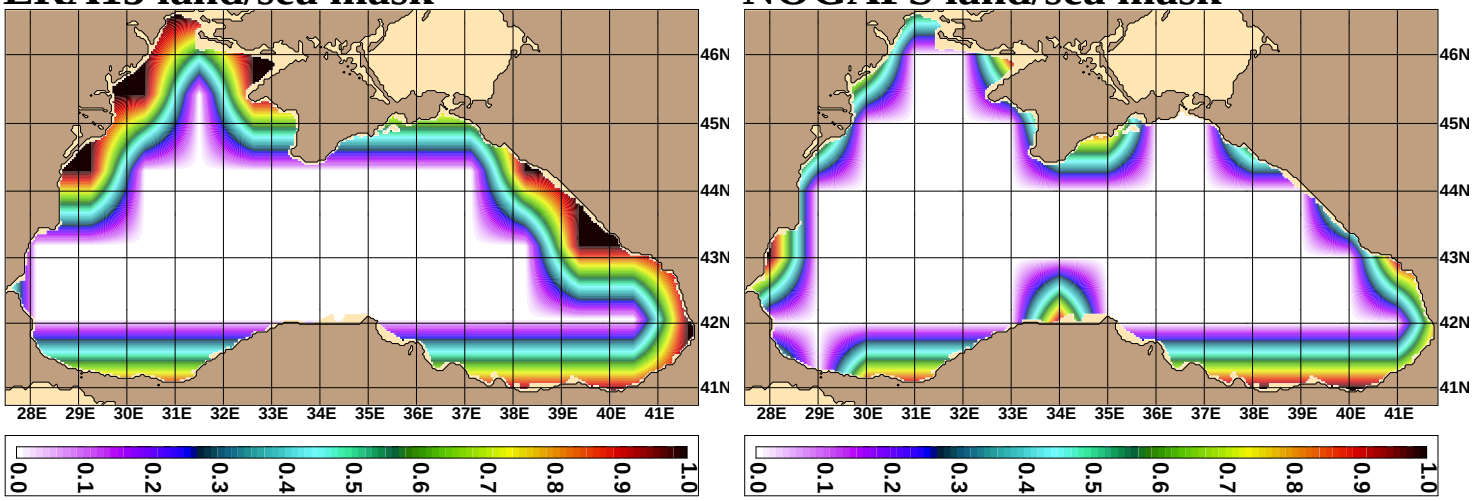
- Scatterometer wind speeds (over ocean only)



Correction for Thermal Forcing

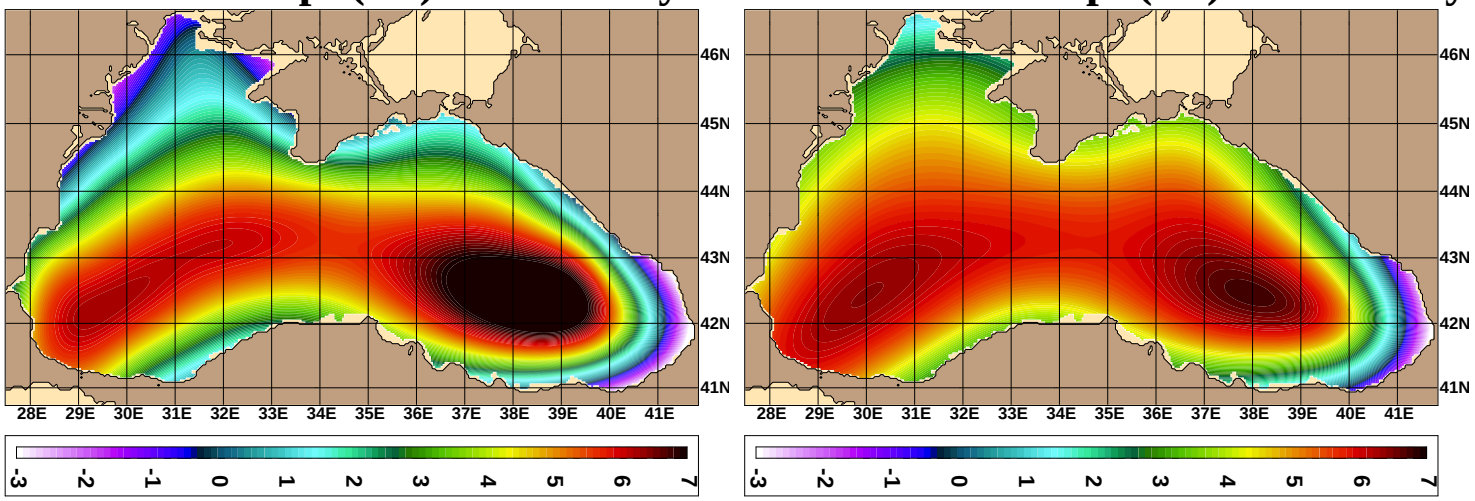
"Creeping Land–Fill" to get rid of land–contamination

ERA15 land/sea mask



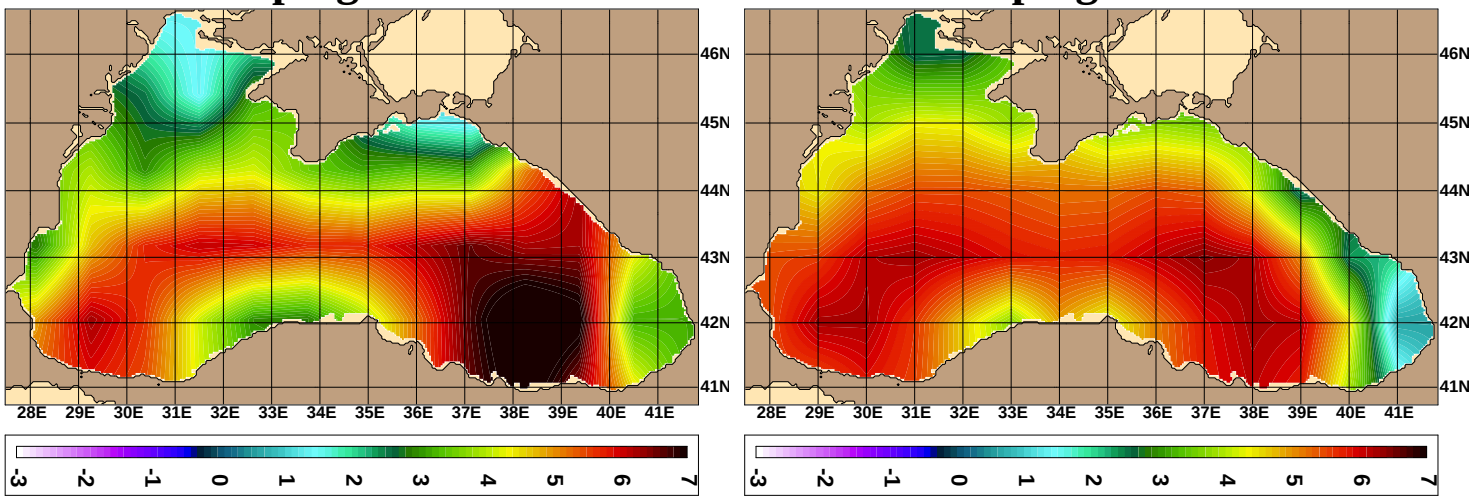
NOGAPS land/sea mask

ERA15 air temp. (°C) in February



NOGAPS air temp. (°C) in February

After the creeping land–fill

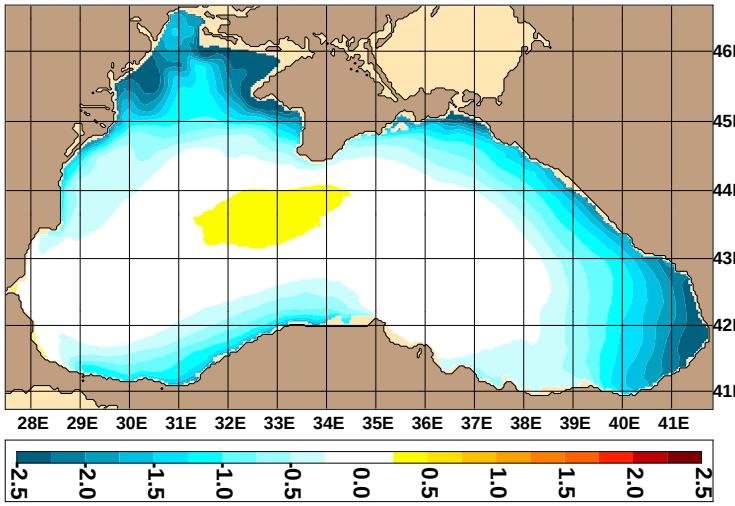


After the creeping land–fill

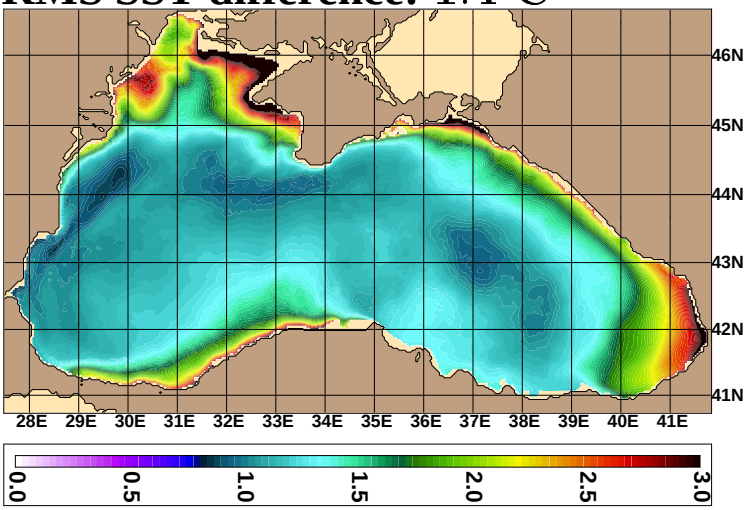
HYCOM Application

HYCOM versus Pathfinder SST climatology for seasonal cycle

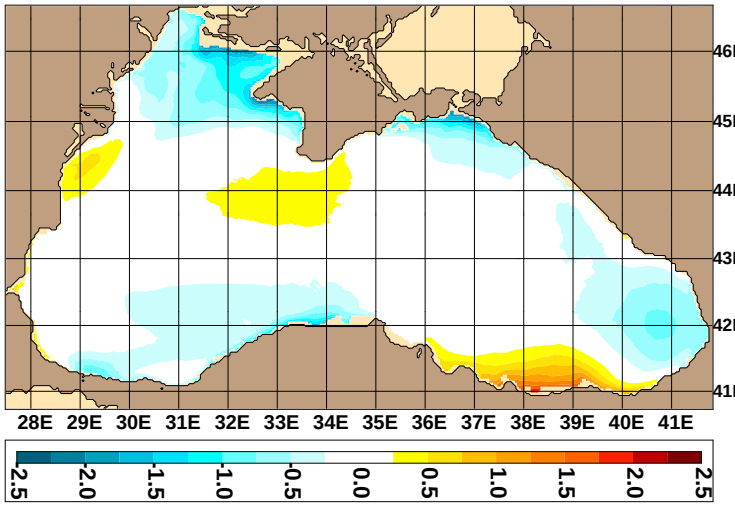
Mean SST bias: $-0.6^{\circ}C$



RMS SST difference: $1.4^{\circ}C$



After the correction : $-0.1^{\circ}C$



After the correction : $1.1^{\circ}C$