

#MarineData4Americas

Ocean Initialization and Analysis using Copernicus Marine Service products

P. Nobre, E. Giarola, M. Baptista, M. Malagutti
National Institute for Space Research - INPE
Brazil

CMEMS data

Data product:

- **Full name:** Global Ocean Physics Analysis and Forecast
- **Product ID:** GLOBAL_ANALYSISFORECAST_PHY_001_024
- **Producer:** CMEMS - Global Monitoring and Forecasting Centre
- **Institution:** MERCATOR OCEAN

Applications:

- 1) Fields of **surface u,v** used for Lagrangian model simulations
- 1) 3-D fields of **T, S, u, v, ssh, ice** used as ocean IC for BESM Forecasts



Motivation - 2019 incident in northeastern Brazil

Oil on 2.000 km of beaches! A game changer!

Brazil's coast - Ago-Dez 2019
5 tons of oil - 2,000 km of beaches

Unusual Behavior by Tankers Near Brazil Oil Spill
November 15, 2019 / by Bjorn Bergman

[Skytruth link](#)

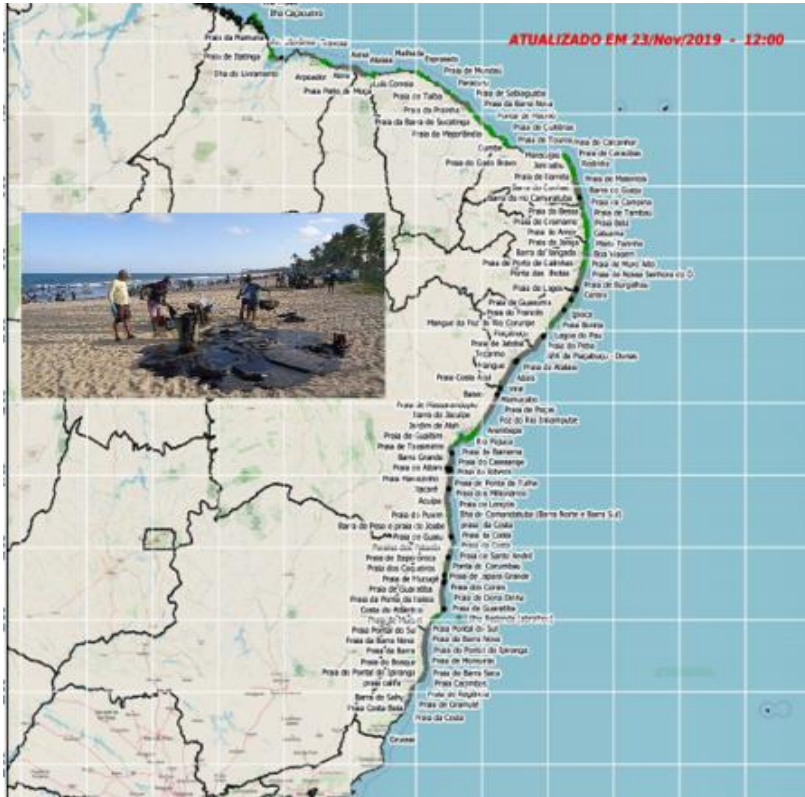


Photo 1. Heavy oil has been sullyng the beaches of northeastern Brazil since early September. The cause remains elusive. [Photo courtesy tvBrasil via Creative Commons license]

Nobre et al. (2021) Northeast Brazil Oil Spill Scenarios

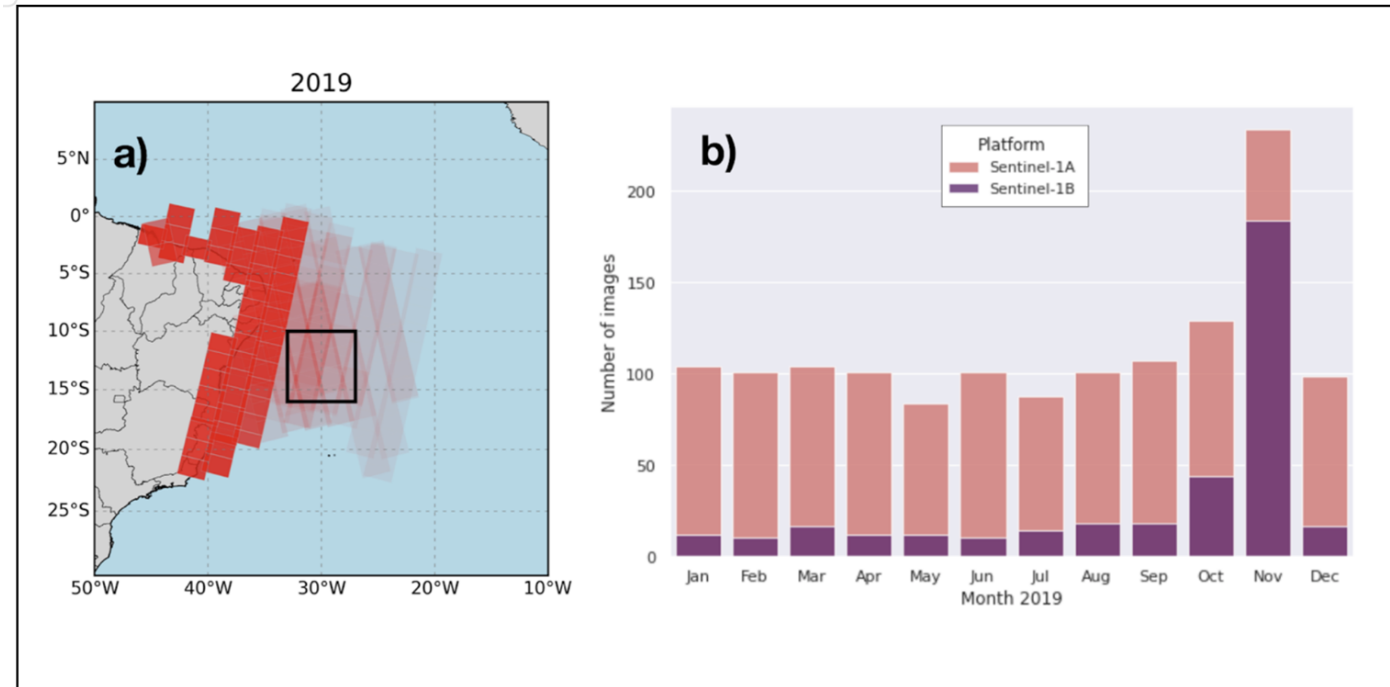
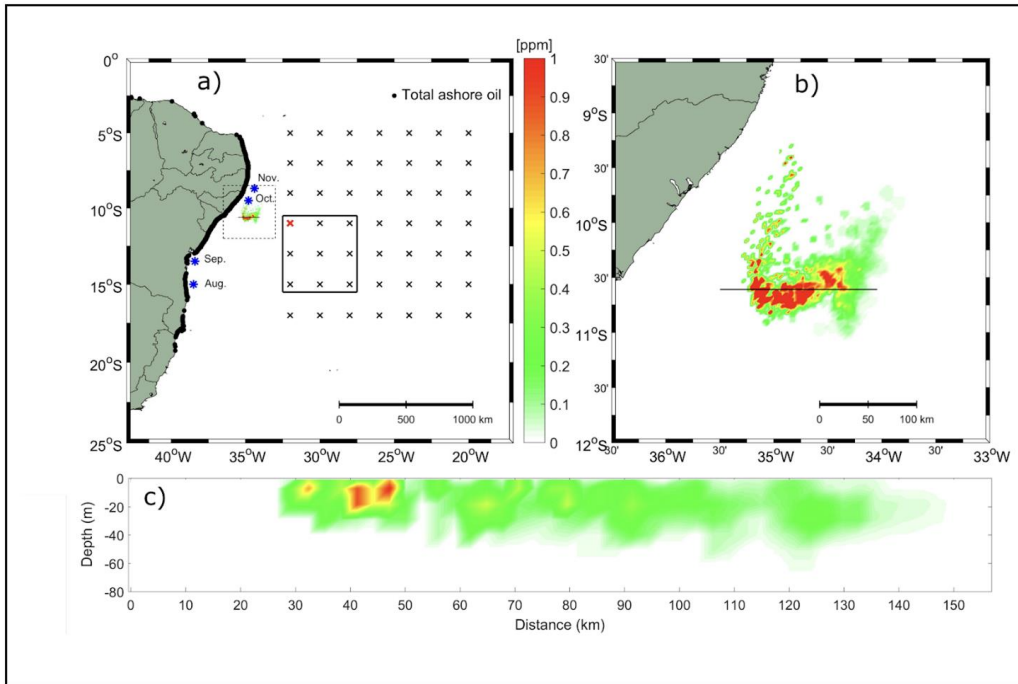
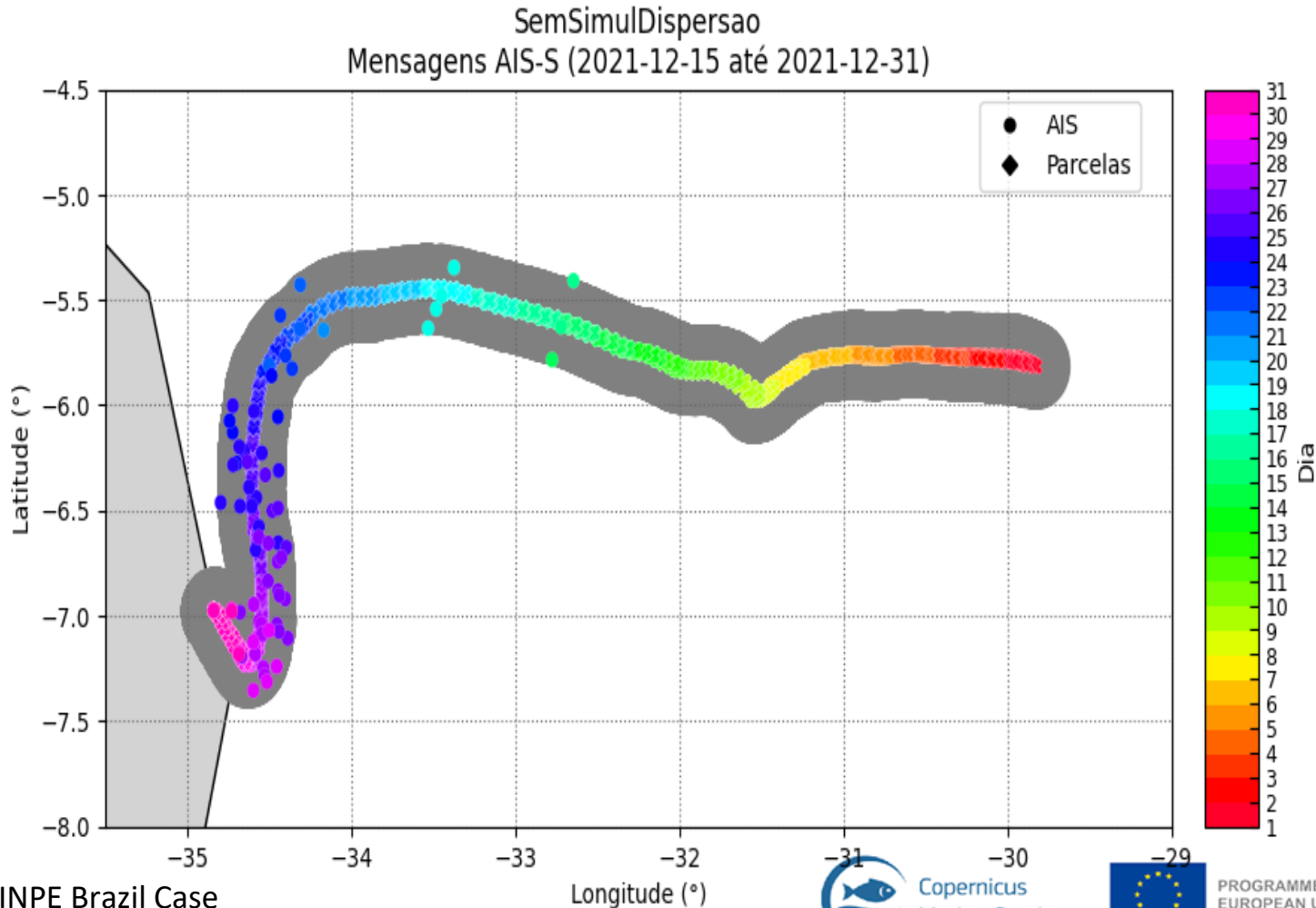


Figure 9: a) Total ashore oil (black dots) of the experiment 22 (red “x”) after 127 days. The blue stars mark the monthly mean position of the South Equatorial Current Bifurcation from August to November provided by Mercator Ocean. The solid black polygon delimits the possible source area identified by the oil spill modeling. The dashed polygon delimits the superficial oil spreading at day 11 from experiment 22, highlighted in b). Oil concentration in the water column at day 11 along the cross black line (c).

Figure 16. Sentinel -1A and -1B scenes for 2019. (a) Geographic coverage: dark (light) red high (low) density of images. (b) Monthly histogram of number of images.

SisMOM: Backward Lagrangian Oil Spill Tracking

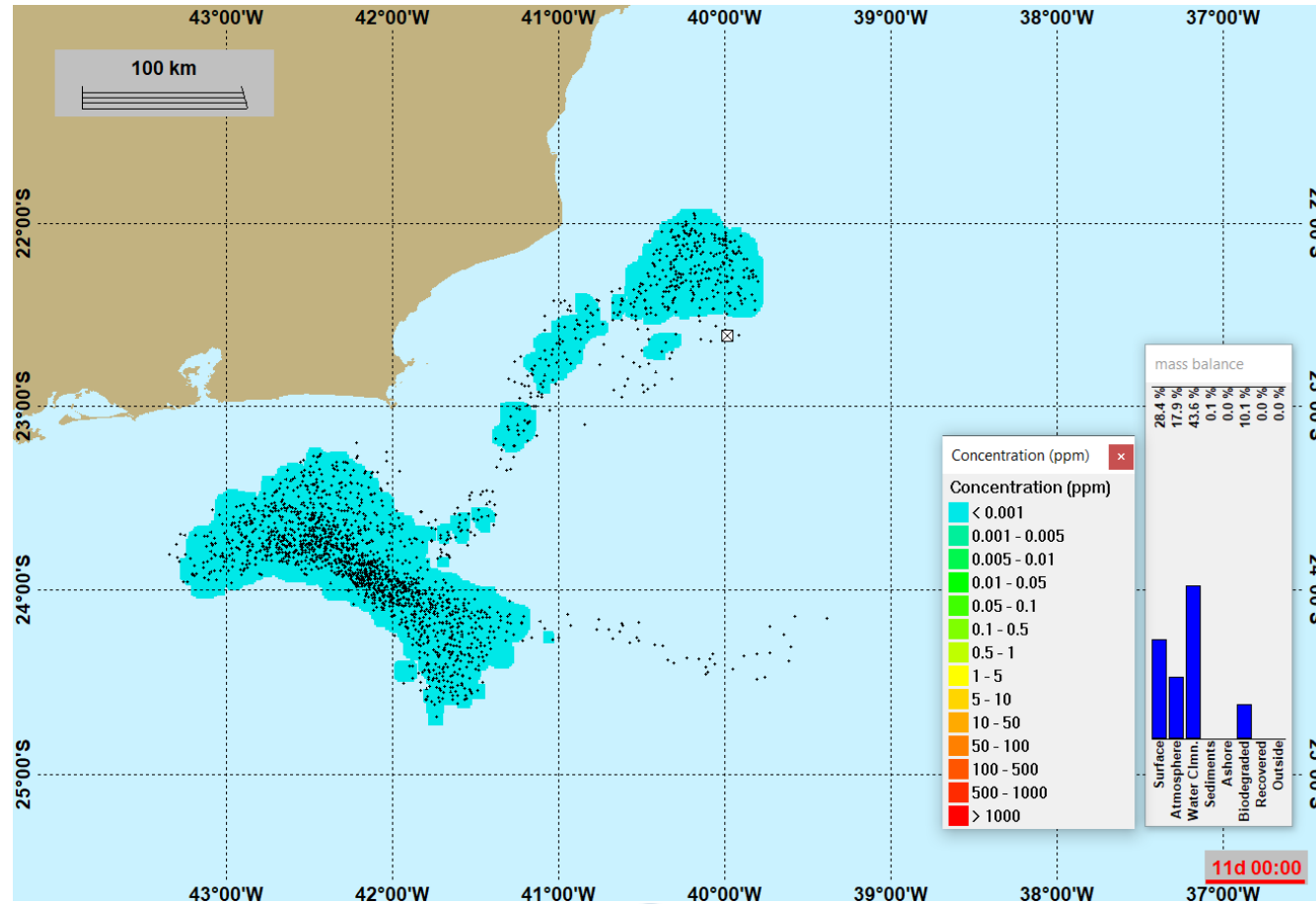
01JAN2022 - Paraíba, Northeast Brazil



Parcels
Lagrangian Model
MERCATOR
Ocean Currents Analyses
Brazilian Navy
AIS ship data

SisMOM: Predicting Oil Spill Dispersion: after an oil spill along the coast of Rio de Janeiro, Brazil

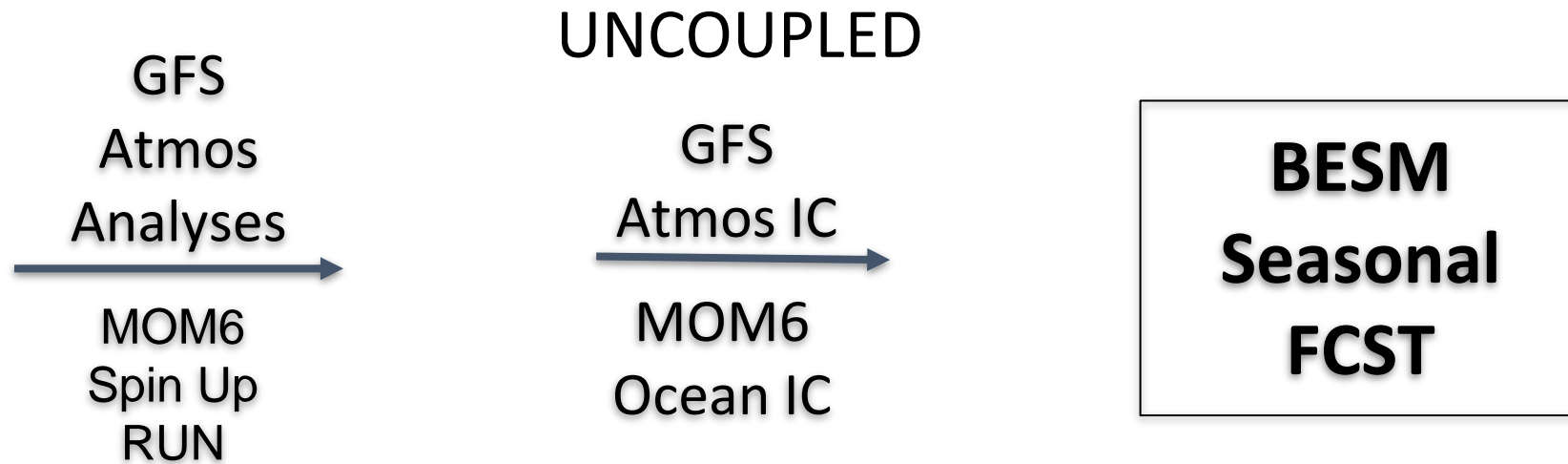
January 2022 - Anchieta Oil Platform Leakage



Oscar
Oil Dispersion Model
MERCATOR
Ocean Currents FCST

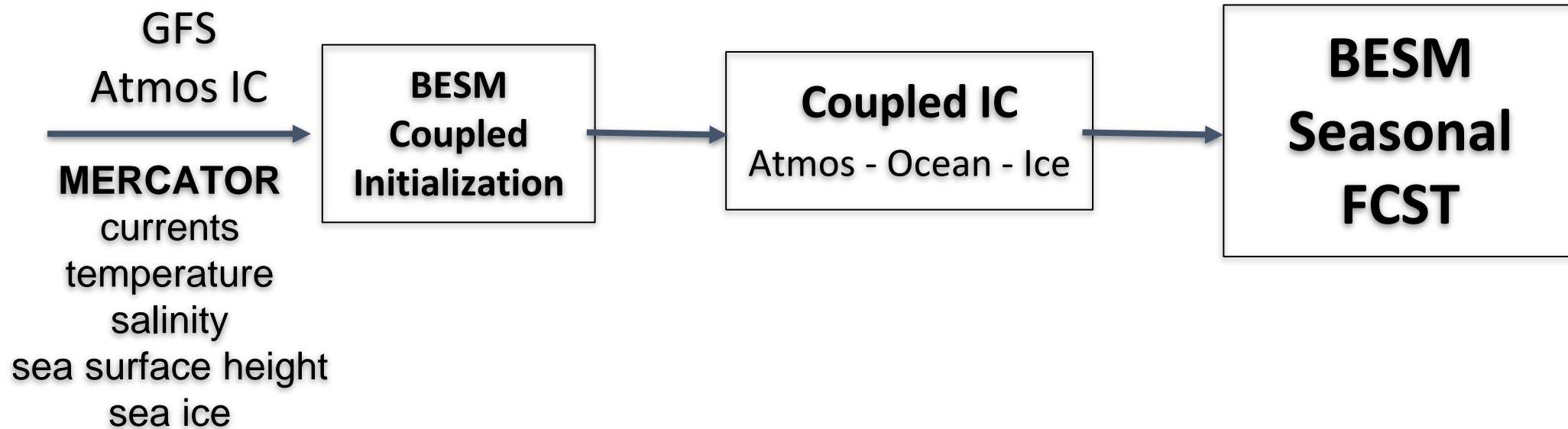
Preparing Initial Conditions for Seasonal Forecasts with the Brazilian Earth System Model - BESM

Spin Up Method



Preparing Initial Conditions for Seasonal Forecasts with the Brazilian Earth System Model - BESM

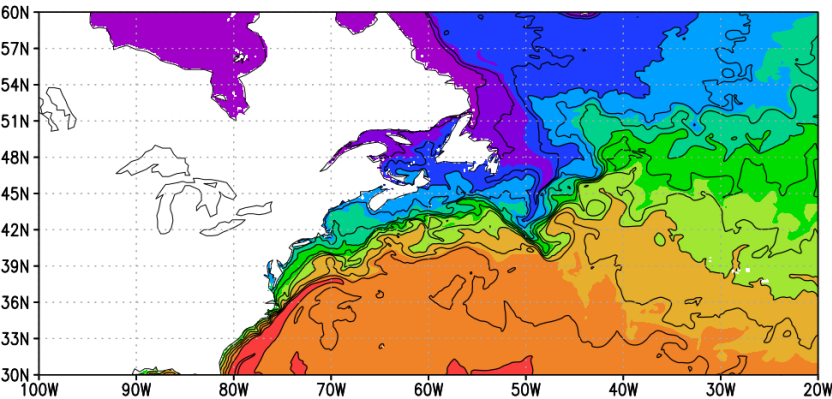
CMEMS Initialization Method



SST

Original SST Field - CMEMS

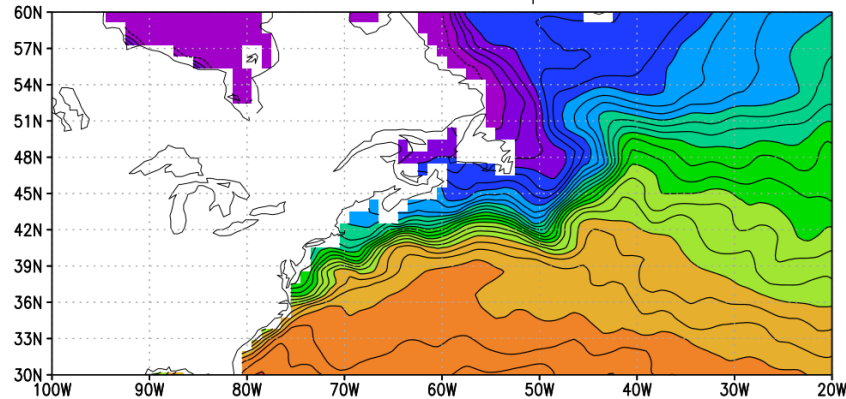
Gulf Stream Region



BESM Initialization

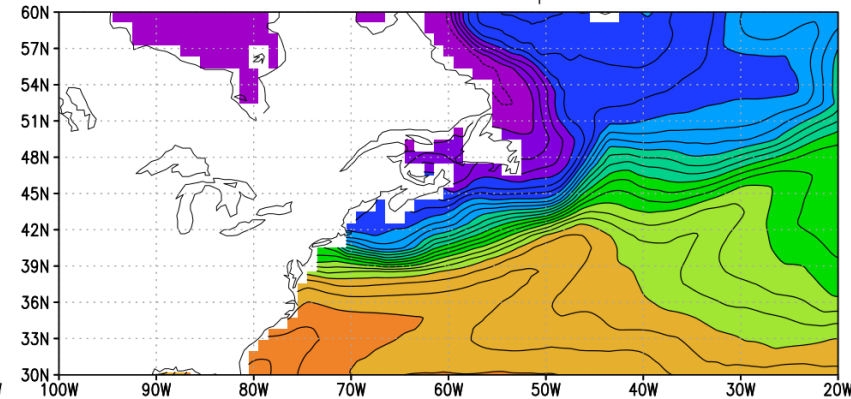
CMEMS Method

SST Jan2021 - exp014

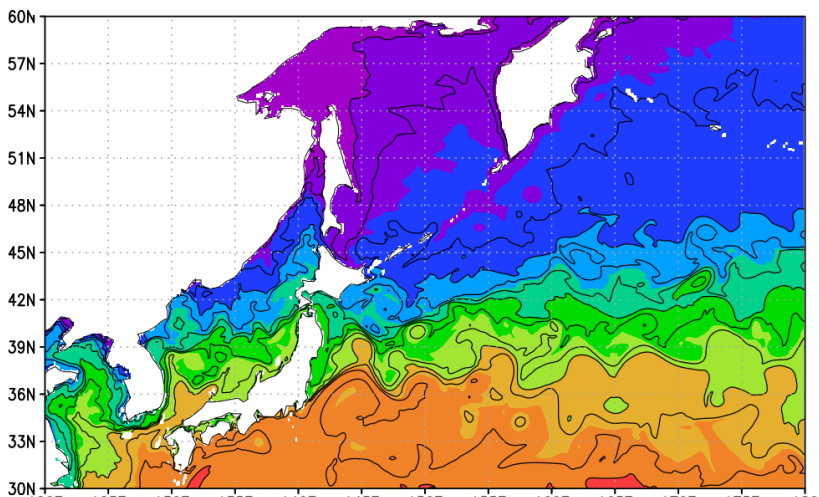


Spin Up Method

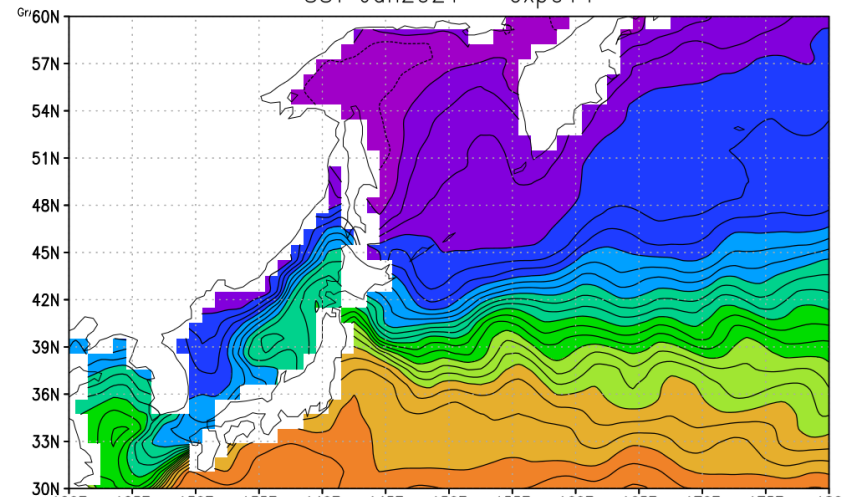
SST Jan2021 - exp016



Kuroshio Current Region



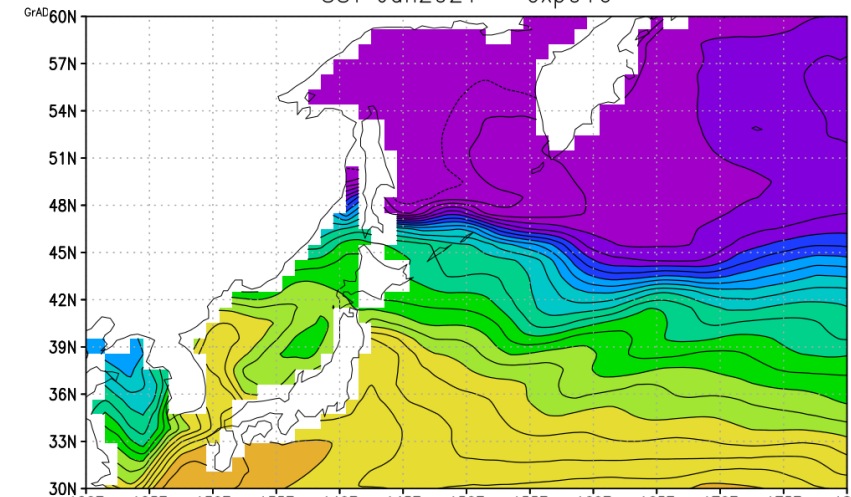
SST Jan2021 - exp014



GrADS/COLA



SST Jan2021 - exp016

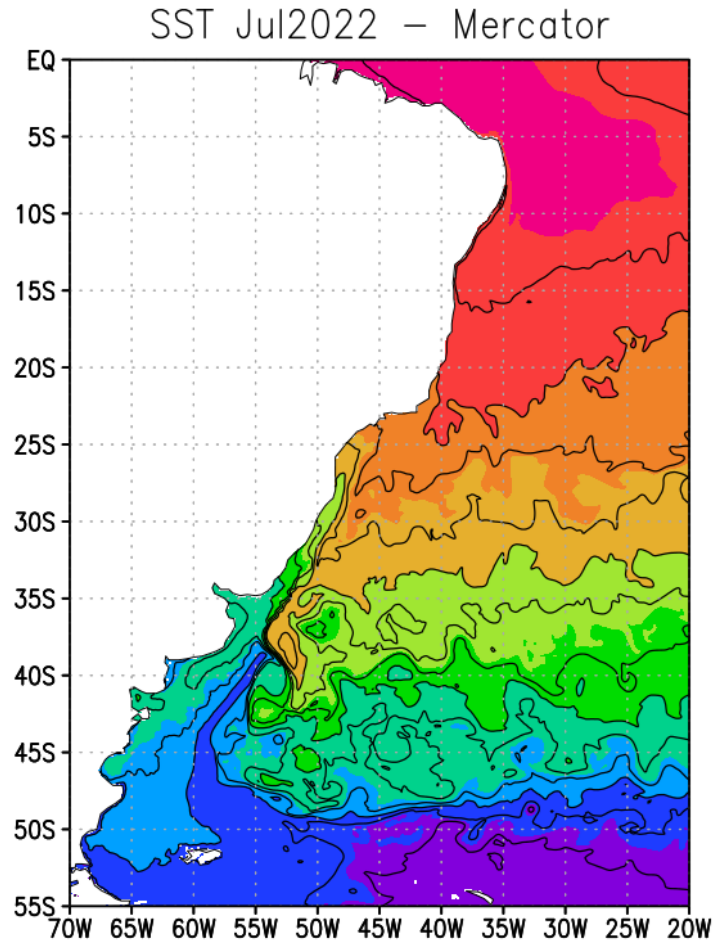


GrADS/COLA

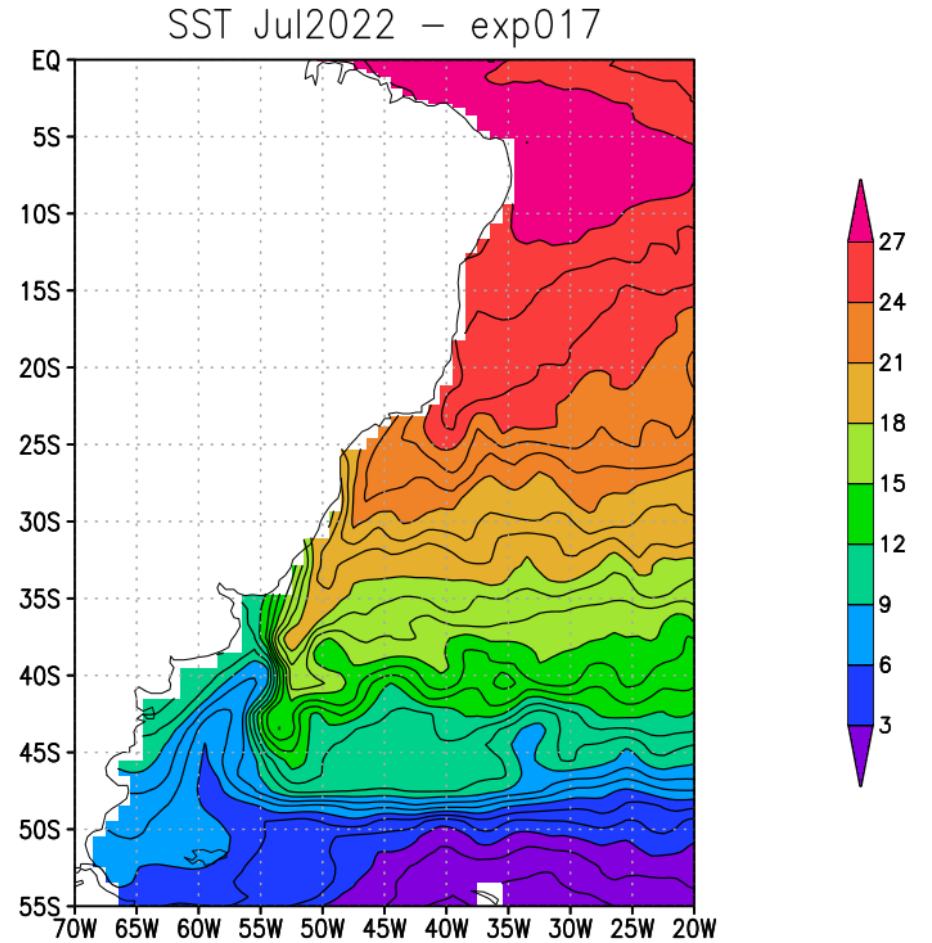


SST - South America

Original SST Field - CMEMS



BESM-O model after incorporating CMEMS data



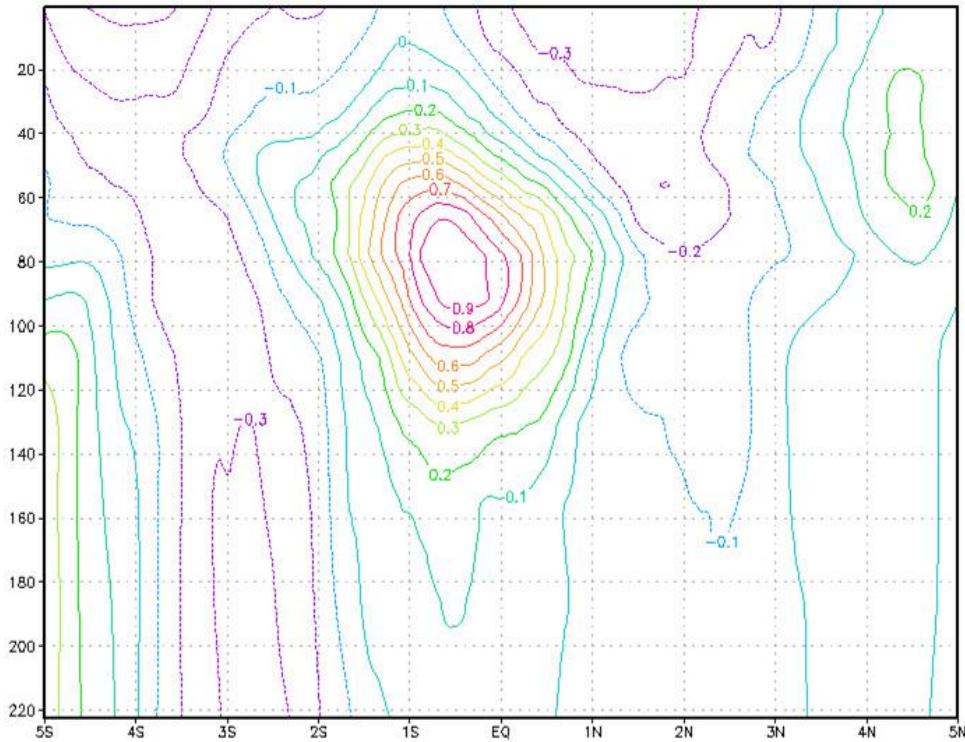
GrADS/COLA



BESM COUPLED PREDICTIONS: Eq. Atlantic Ocean Undercurrent

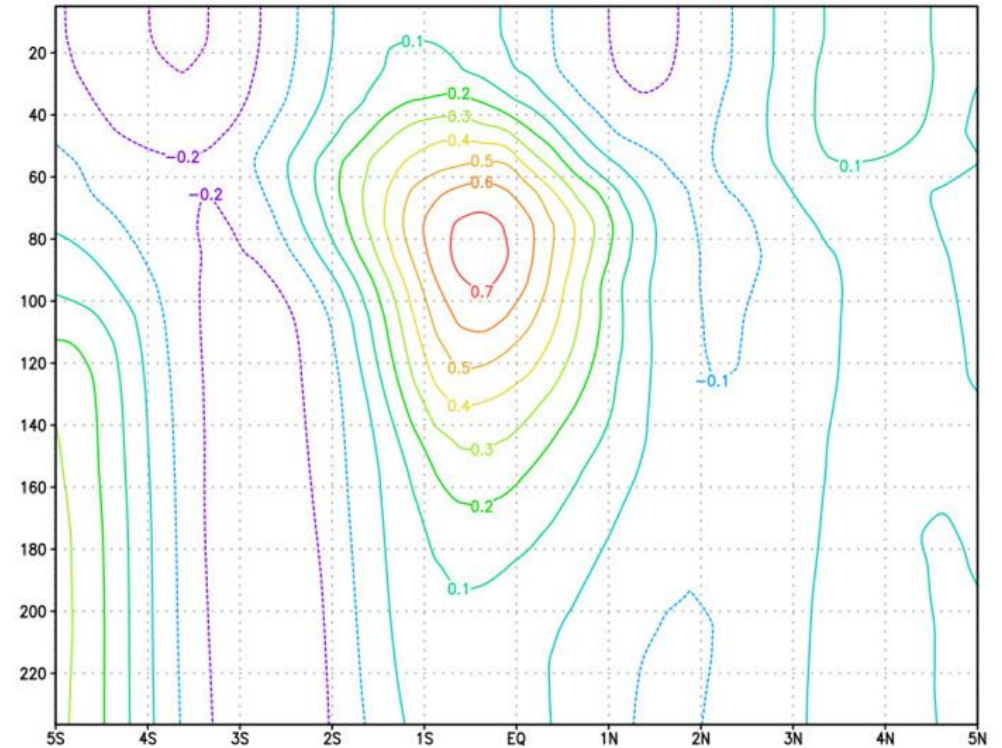
MERCATOR ANALYSIS

Mercator UO 23W (November 2023)



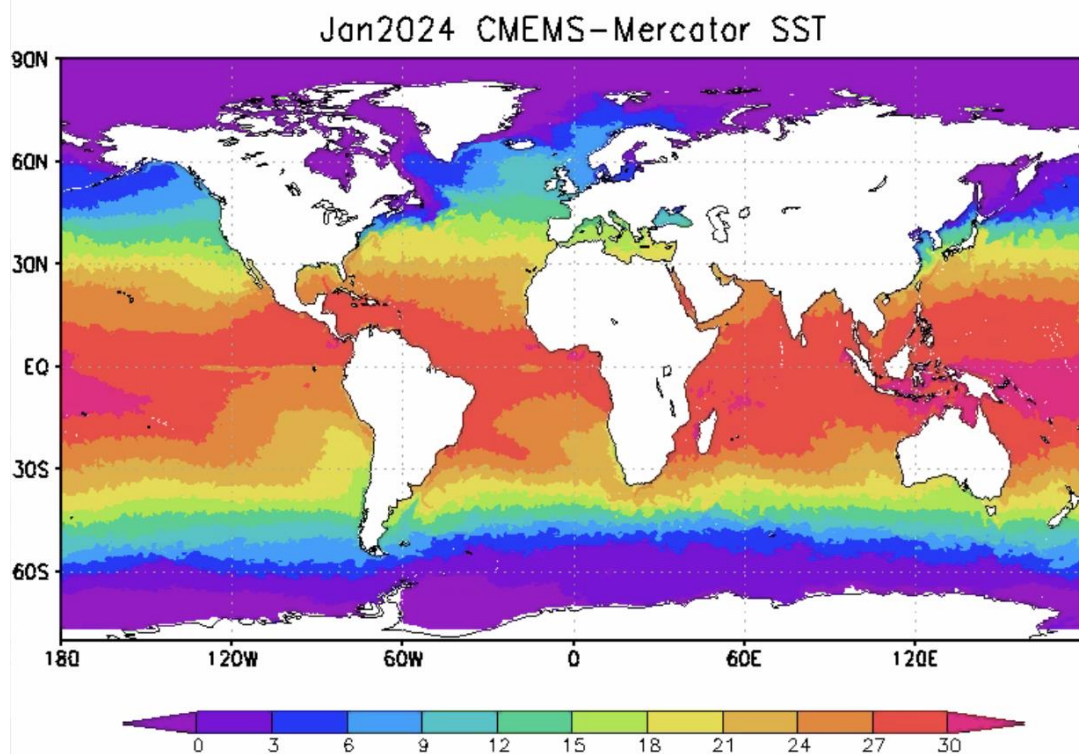
BESM 30 days FCST

BESM Ucur 23W (November 2023, ic Oct2023)



BESM COUPLED PREDICTIONS: GLOBAL SST

MERCATOR ANALYSIS



BESM 30 days FCST

