

Improving the ocean component of the operational HWRF and GFDN/GFDN hurricane models

Isaac Ginis, Biju Thomas (URI)

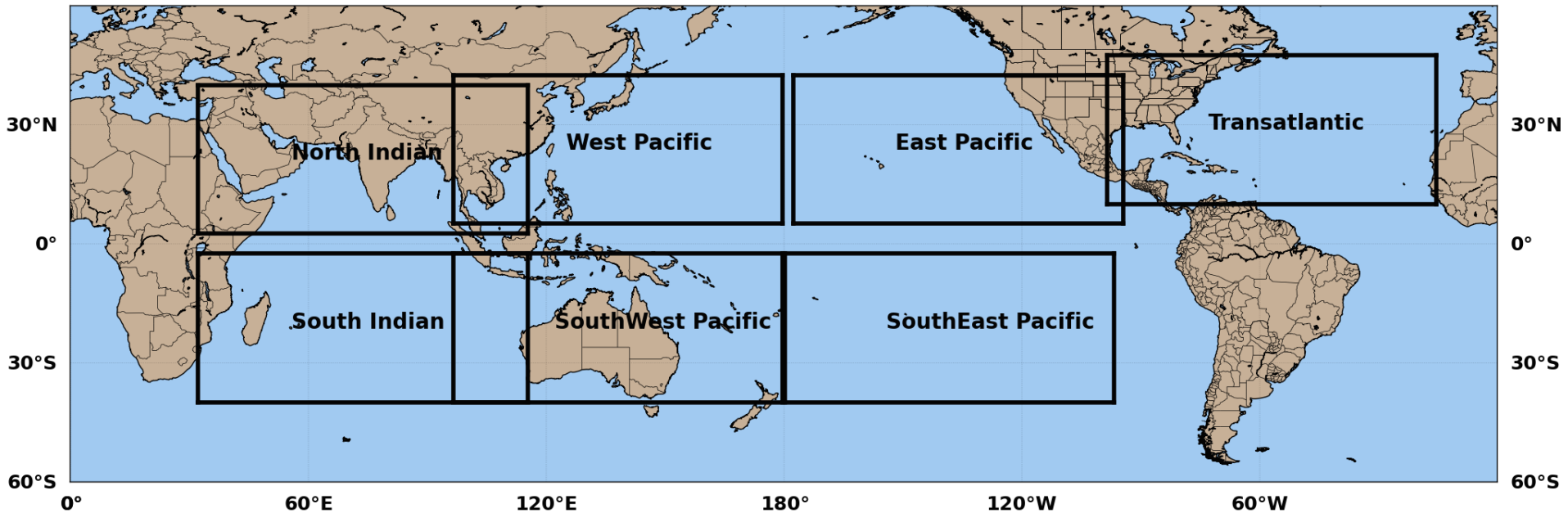
Morris Bender (GFDL), Vijay Tallapragada (NCEP)

JHT and HFIP funded projects

Special thanks to our collaborators at EMC, GFDL, HRD and DTC

Tropical Cyclone Research Forum/69th Interdepartmental Hurricane Conference

Extending MIPOM domains worldwide in GFDL/GFDN and HWRF hurricane models



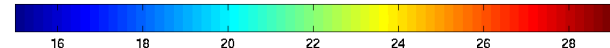
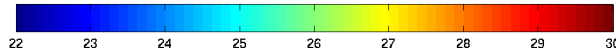
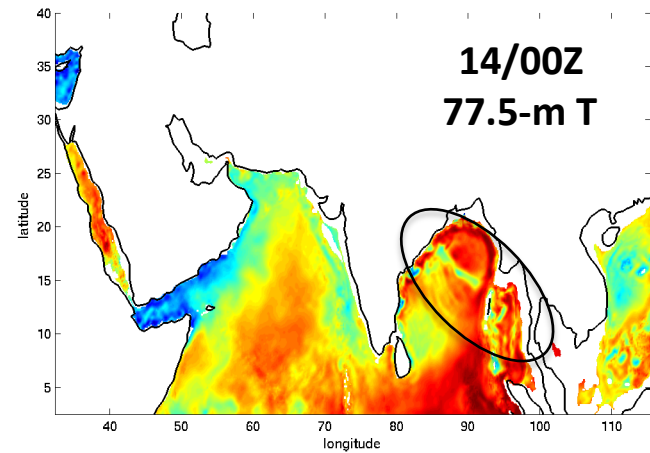
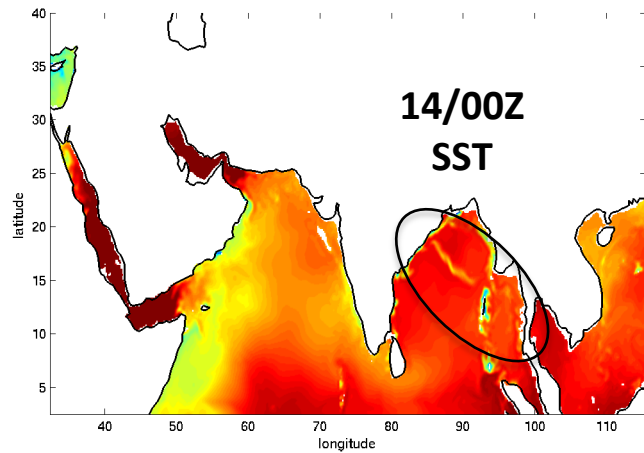
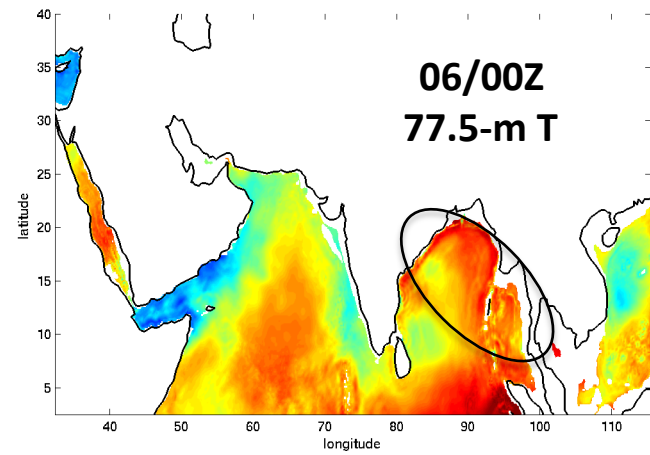
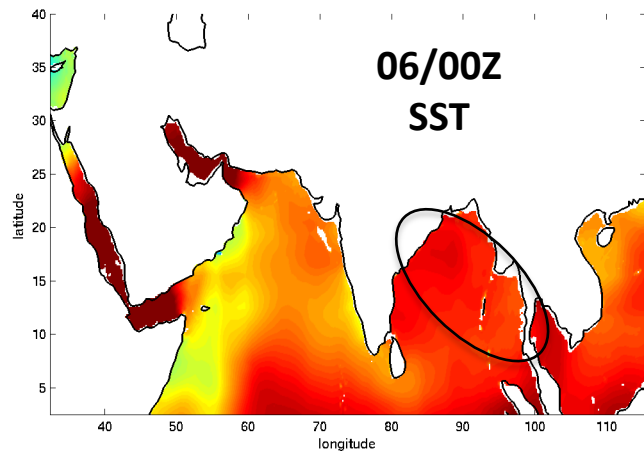
MIPOM is the ocean component of the operational GFDL/GFDN and HWRF hurricane models

MPIPOM Flexible Initialization Options: Implementation and evaluation in 2015

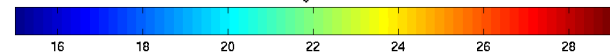
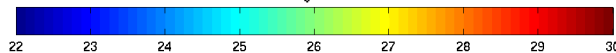
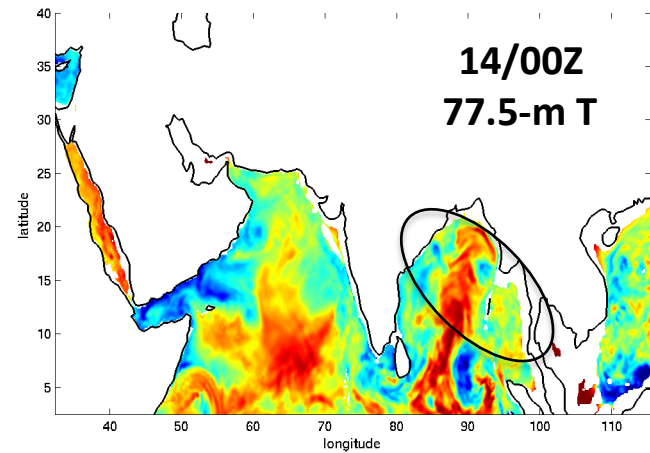
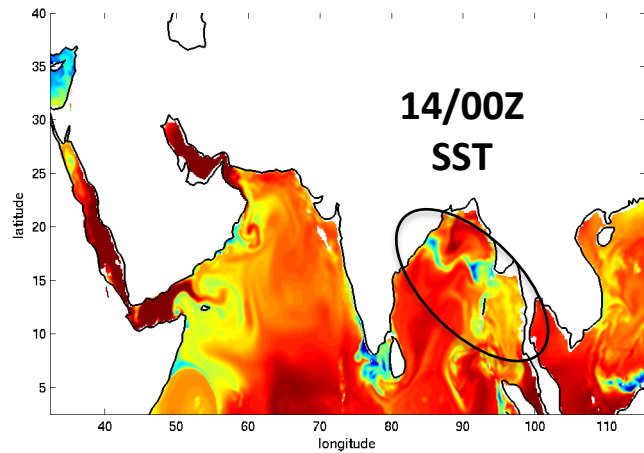
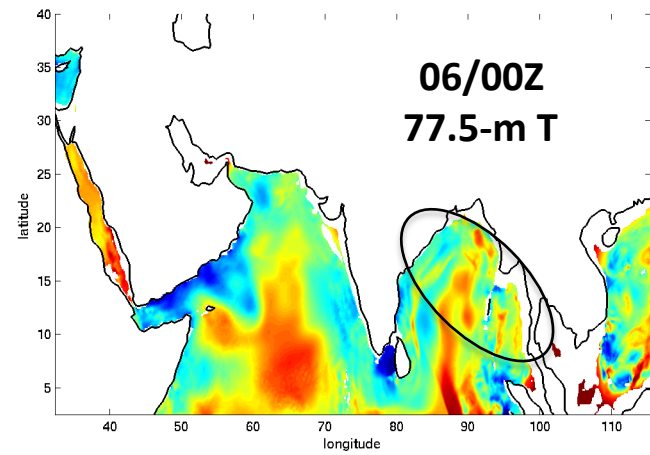
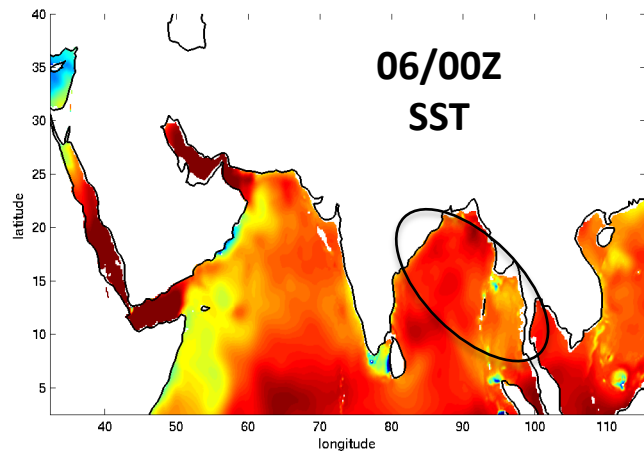
1. Feature-based modifications to GDEM monthly temperature (T) and salinity (S) climatology with assimilated daily GFS SST (**FB**)
2. Navy Ocean Data Assimilation daily T and S fields (**NCODA**)
3. HYbrid Coordinate Ocean Model global daily product (**HYCOM**)

**** All of these ocean products are available in the public domain for real time tropical cyclone forecasting***

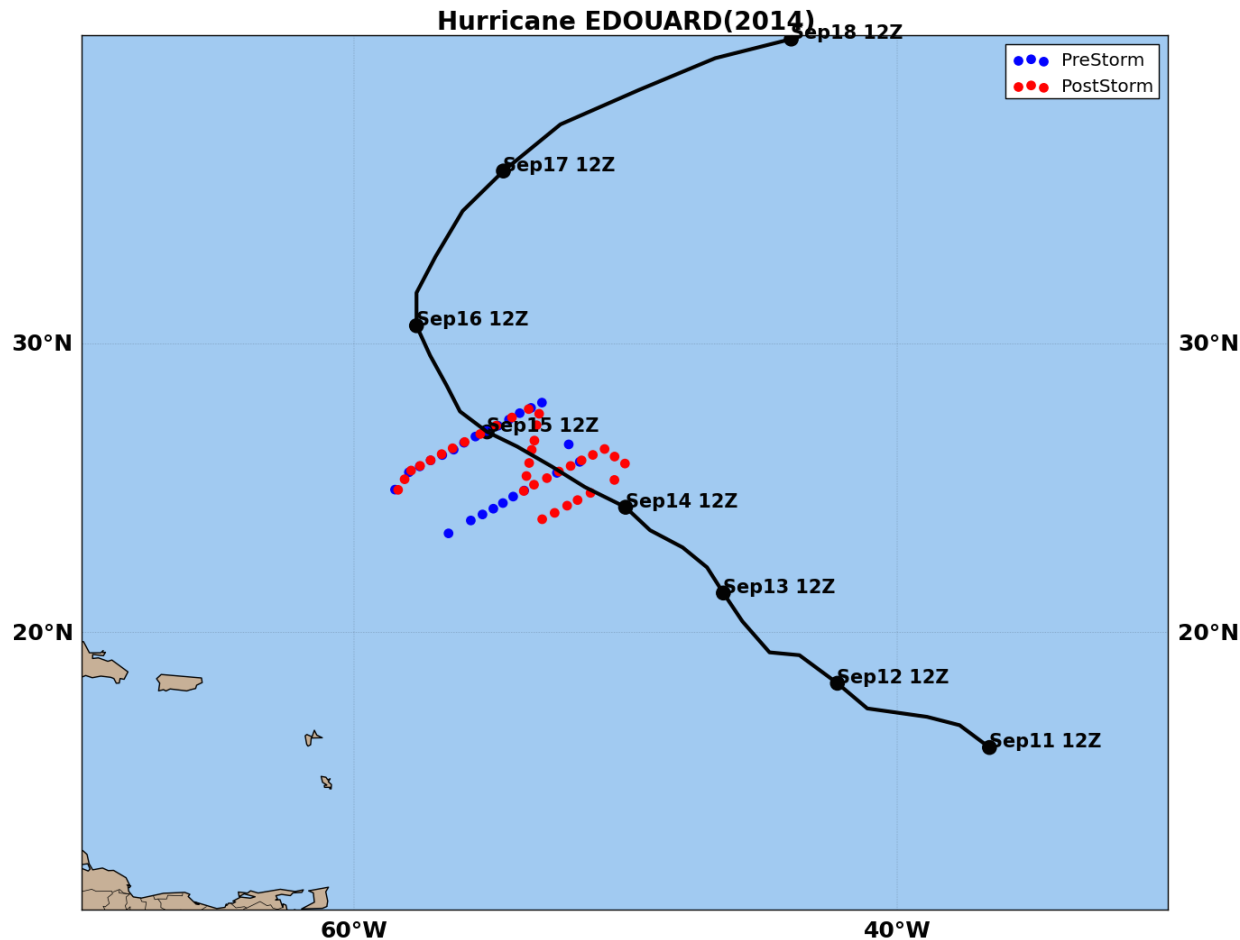
MPIPOM North Indian Domain: Ocean Response to Cyclone Phailin with **FB** initialization: 2013100600-1400



MPIPOM-TC North Indian Domain: Ocean Response to Cyclone Phailin with **NCODA** initialization: 2013100600-1400

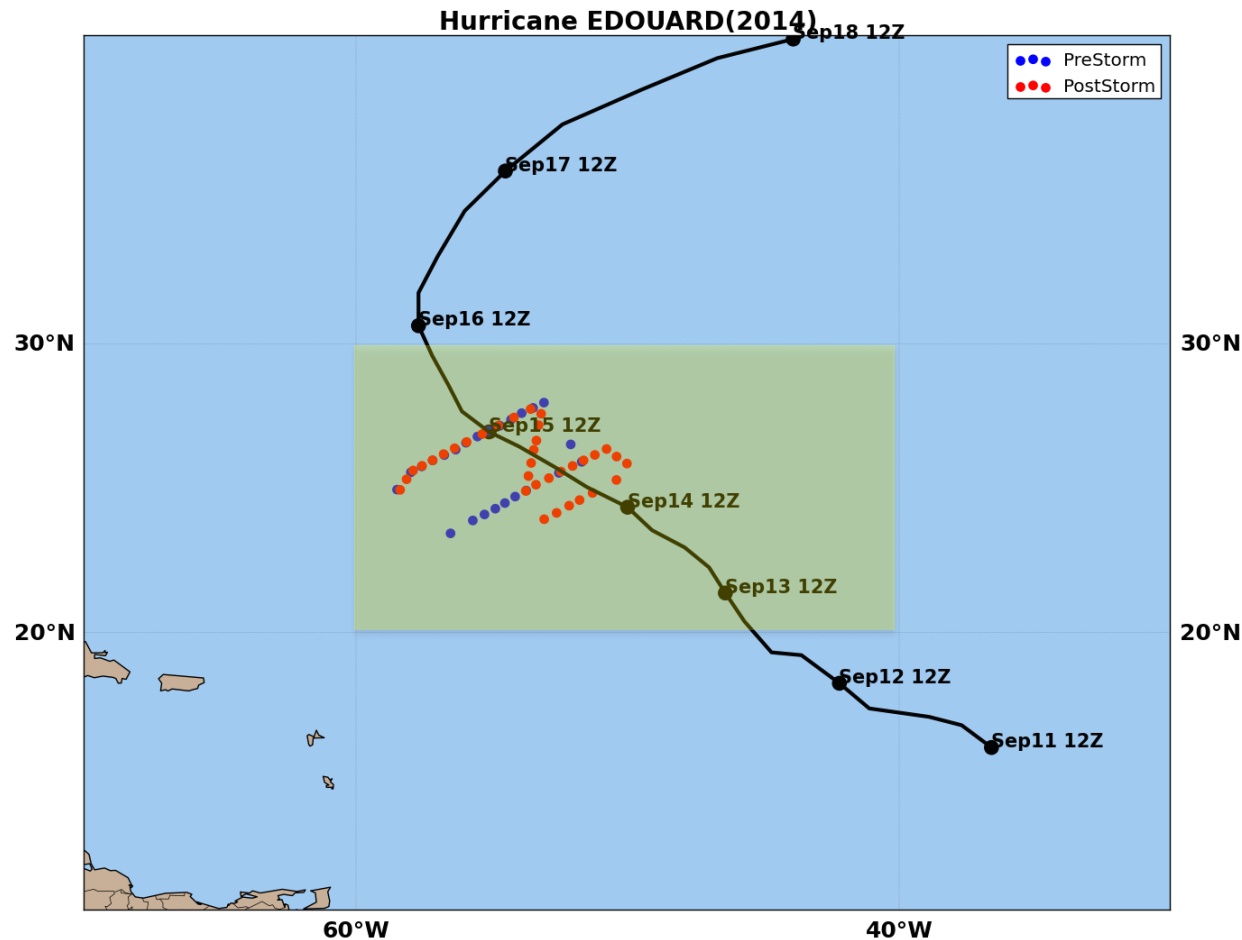


Evaluation of Ocean Initialization Options: Hurricane Edouard (2014)

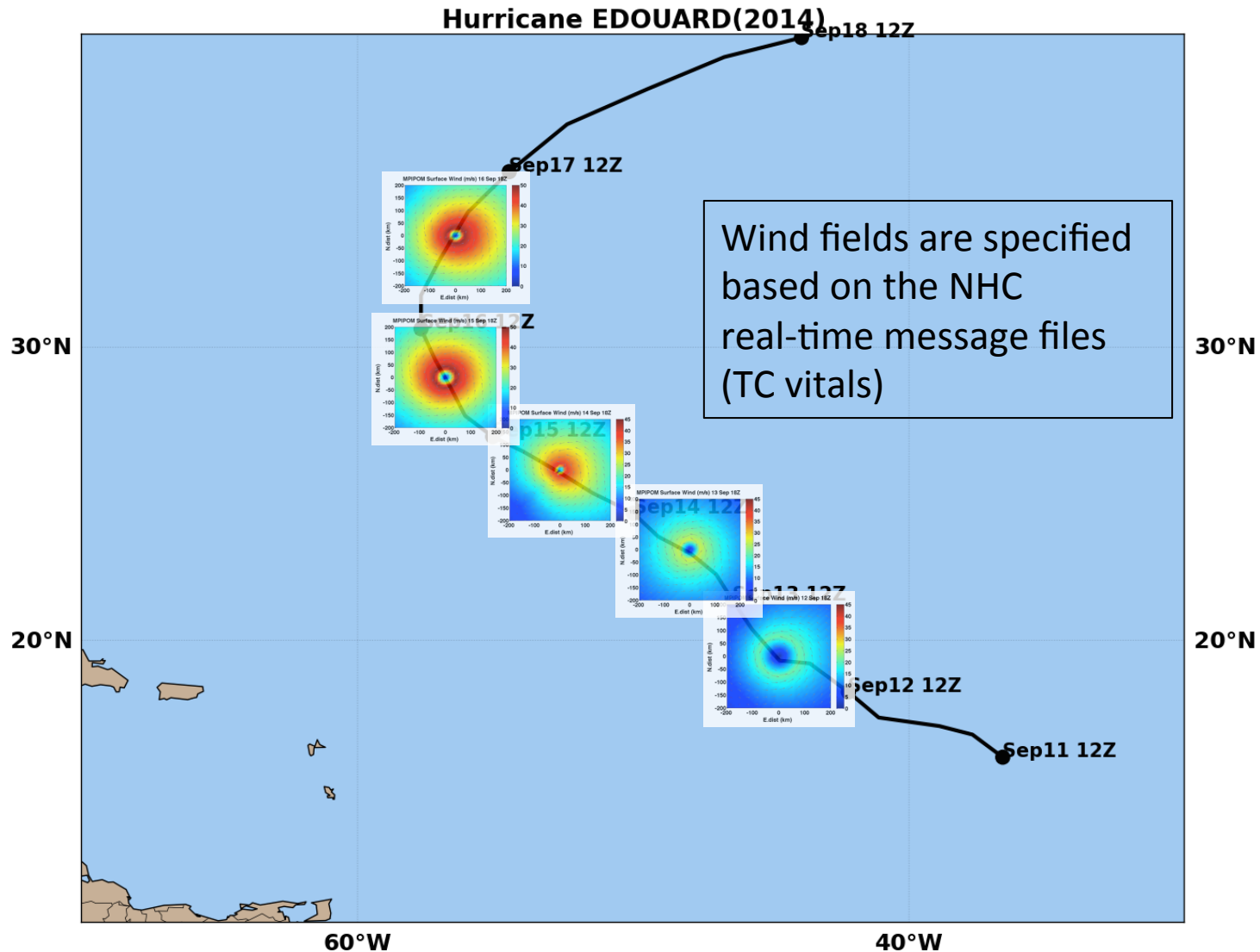


Special thanks to Eric Ulhorn (HRD) for providing the AXBT data

Evaluation of Ocean Initialization Options: Hurricane Edouard (2014)

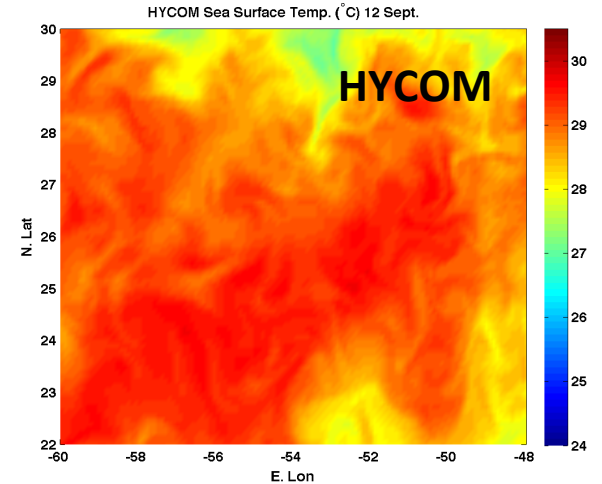
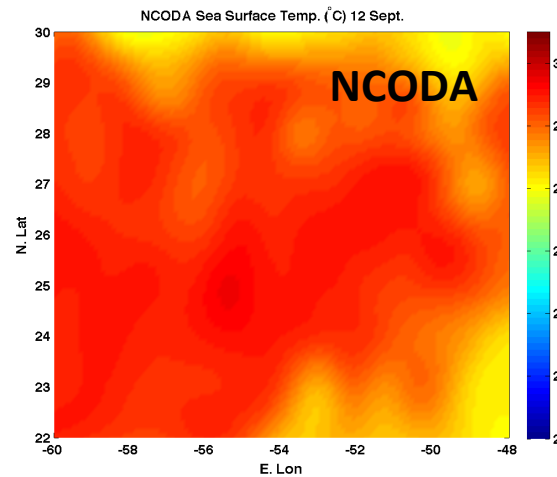
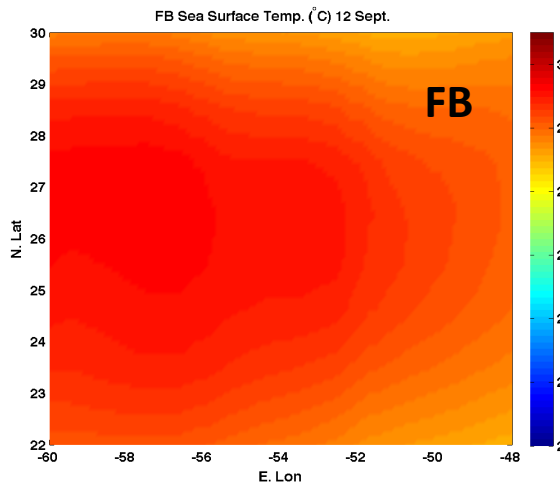


Evaluation of Ocean Initialization Options: Hurricane Edouard (2014)

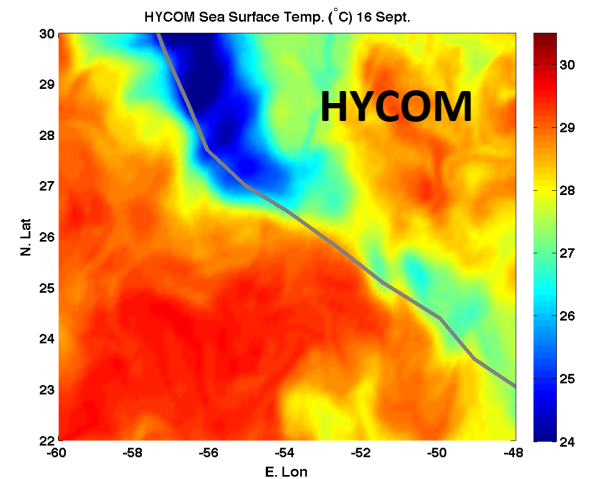
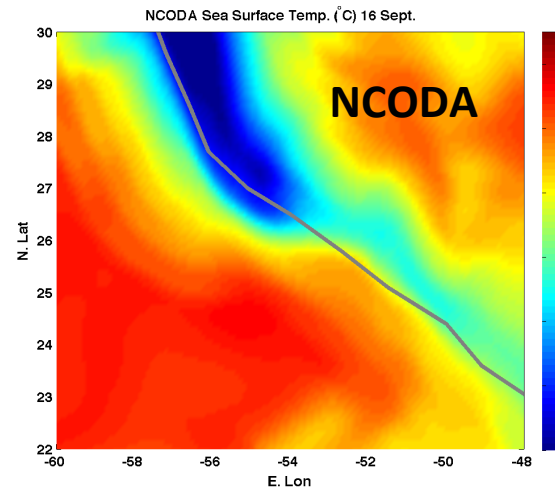
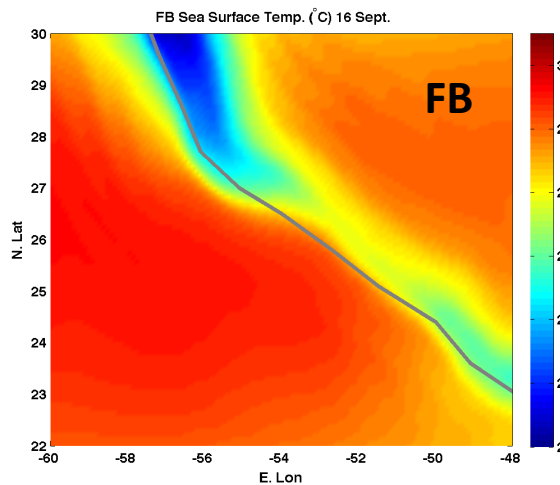


Evaluation of Ocean Initialization Options: Hurricane Edouard (2014)

September 12, 2014 (pre-storm)

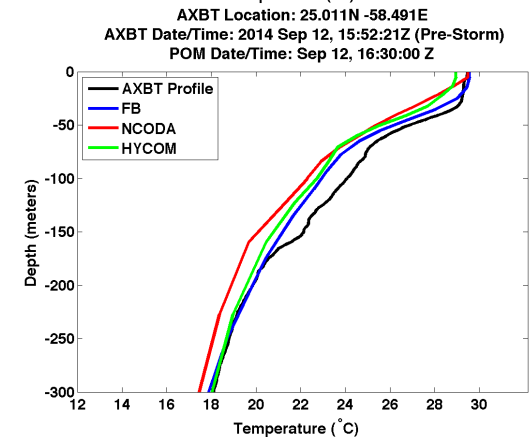
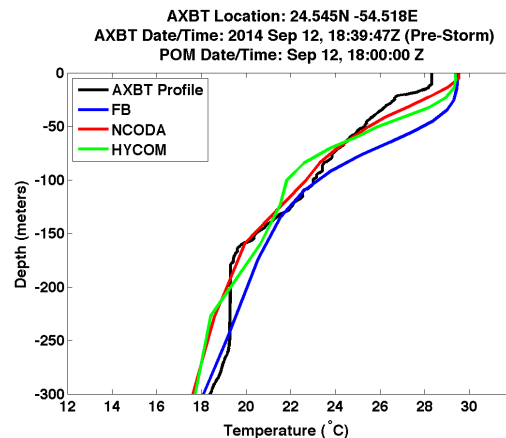
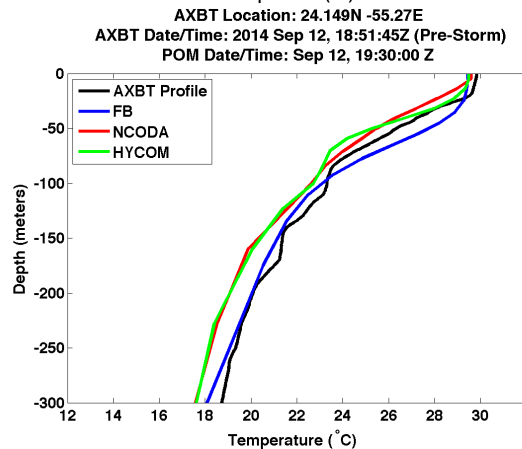
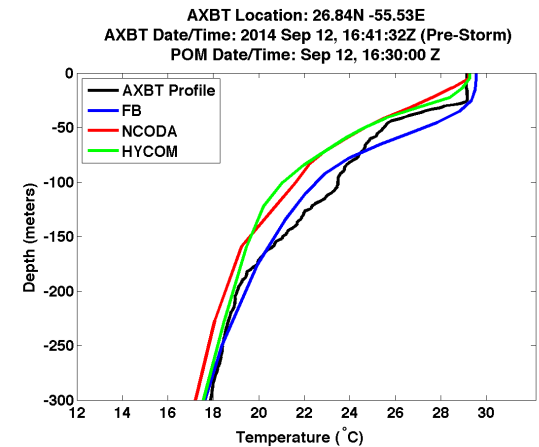
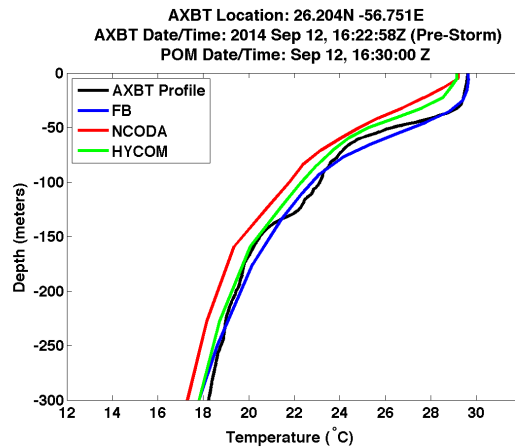
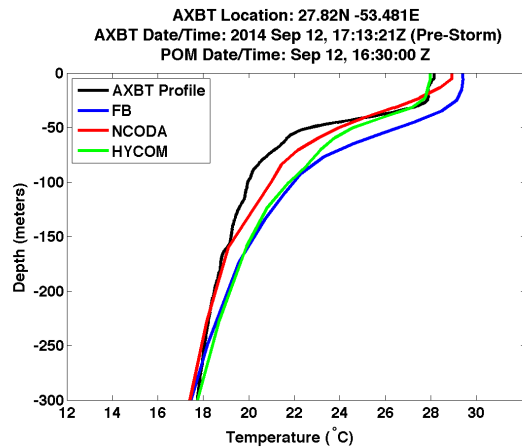


September 16, 2014



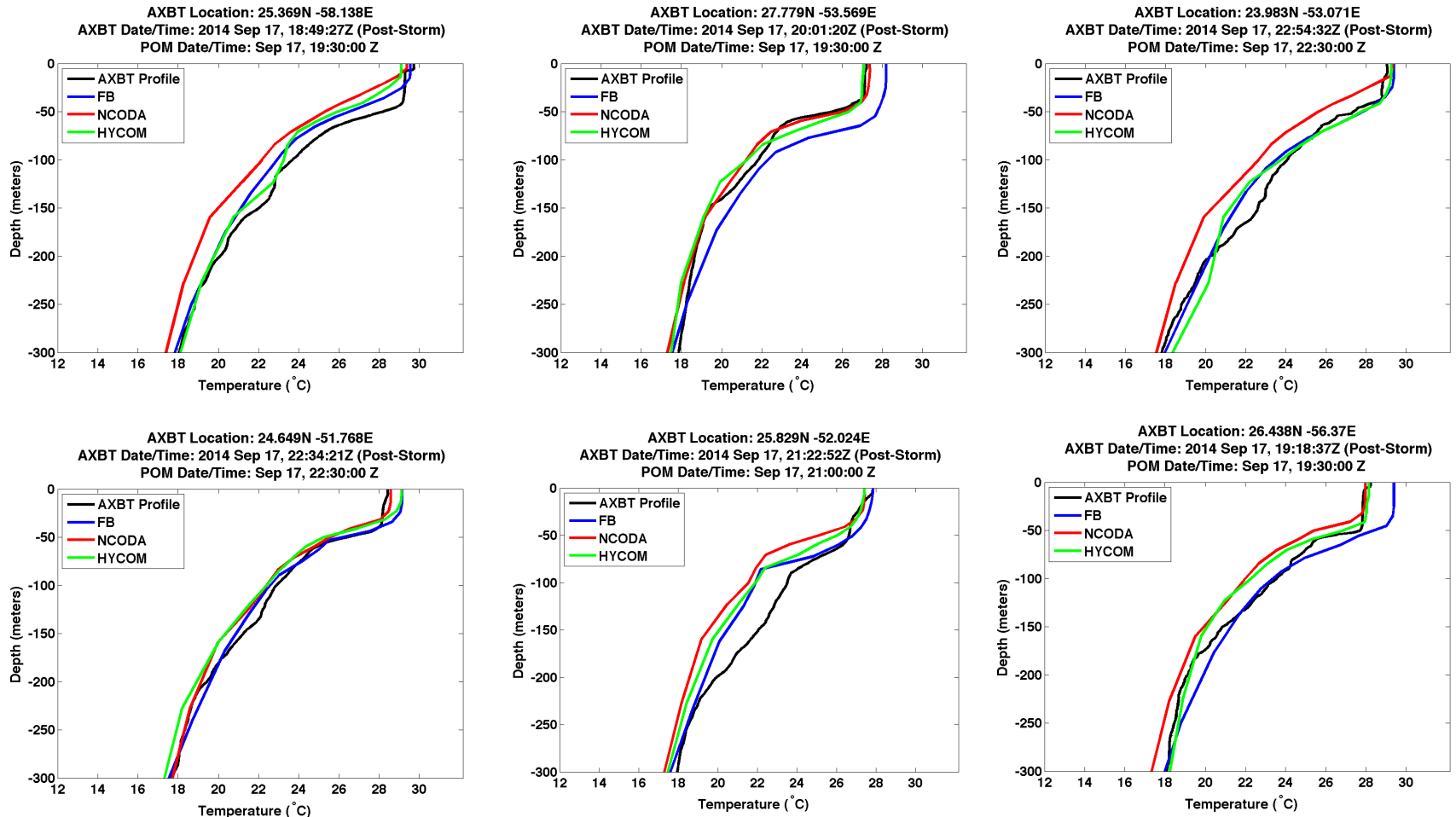
Evaluation of Ocean Initialization Options: Comparison with AXBTs

September 12, 2014 (pre-storm)



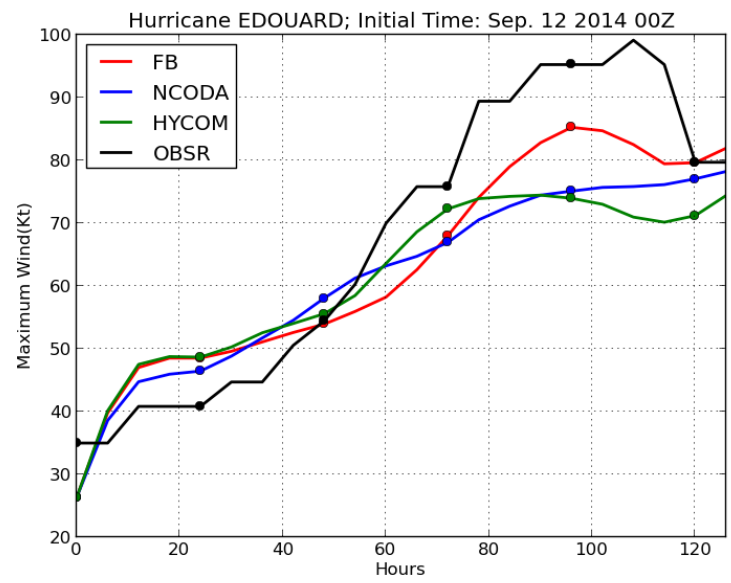
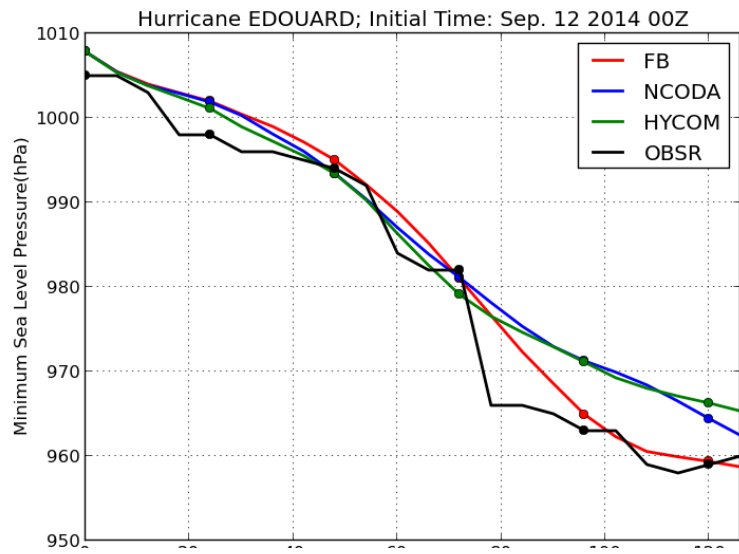
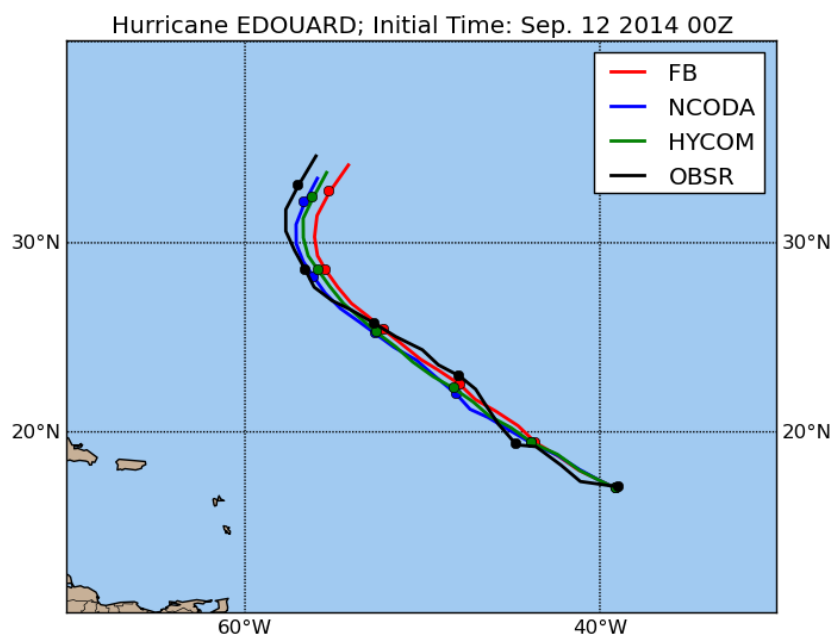
Evaluation of Ocean Initialization Options: Comparison with AXBTs

September 17, 2014 (post-storm)



Evaluation of Ocean Initialization Options: Impact on Hurricane Forecasting: Edouard (2014)

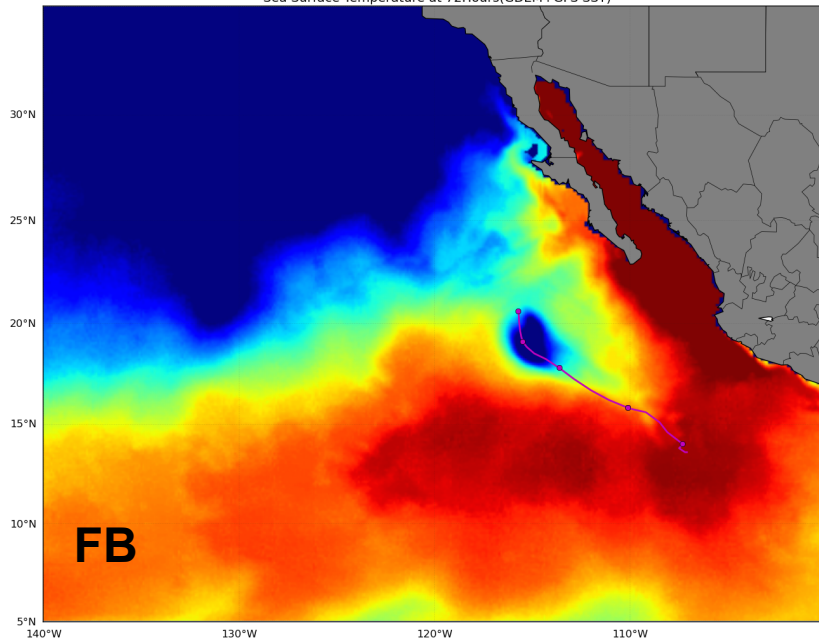
GFDL Model Initial time: Sep 12 00Z



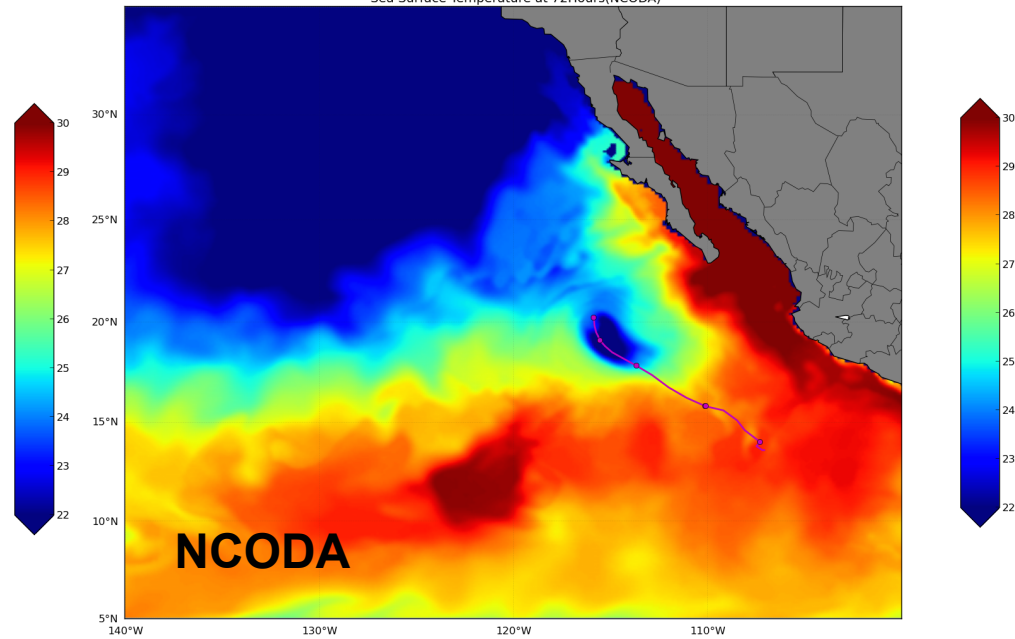
Evaluation of Ocean Initialization Options: Impact on Hurricane Forecasting: Miriam (2012)

GFDL model 72-hr forecast. Initial time: September 23 18Z

Hurricane: MIRIAM(Sep. 23 2012 18Z)
Sea Surface Temperature at 72Hours(GDEM+GFS SST)

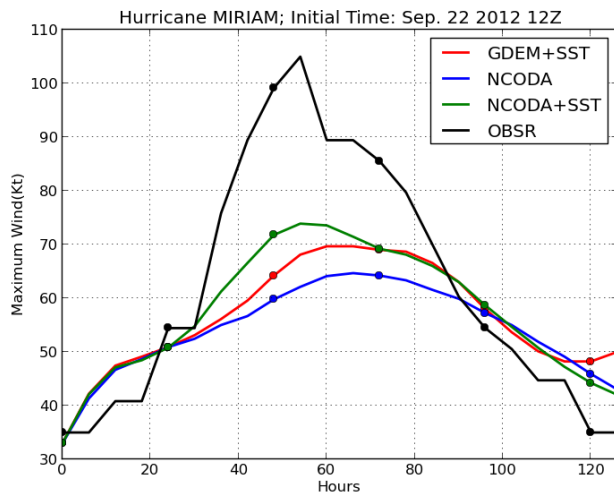
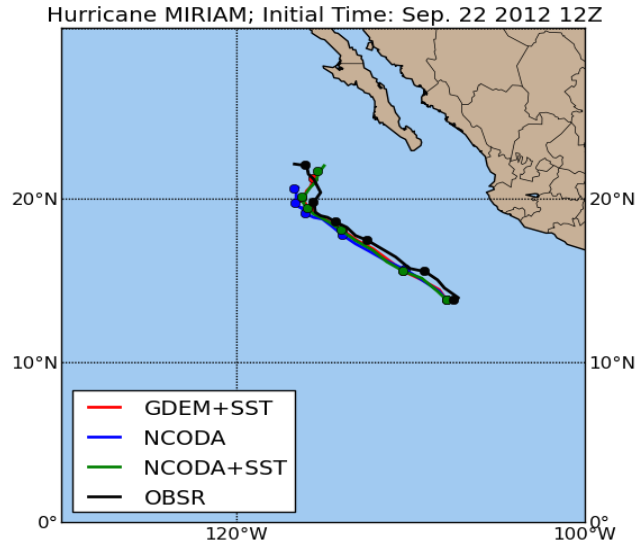


Hurricane: MIRIAM(Sep. 23 2012 18Z)
Sea Surface Temperature at 72Hours(NCODA)

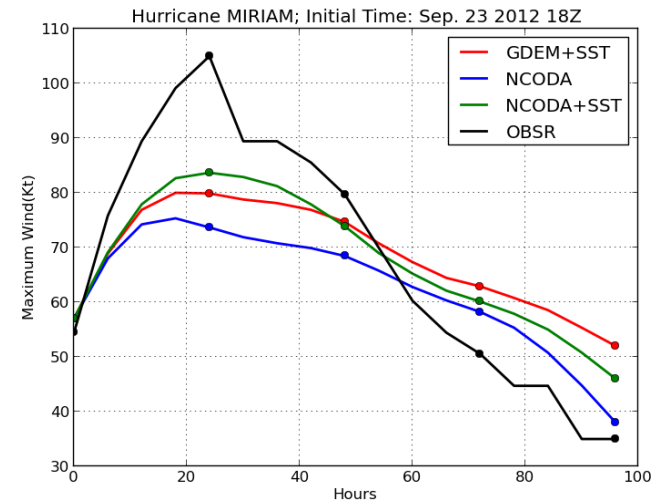
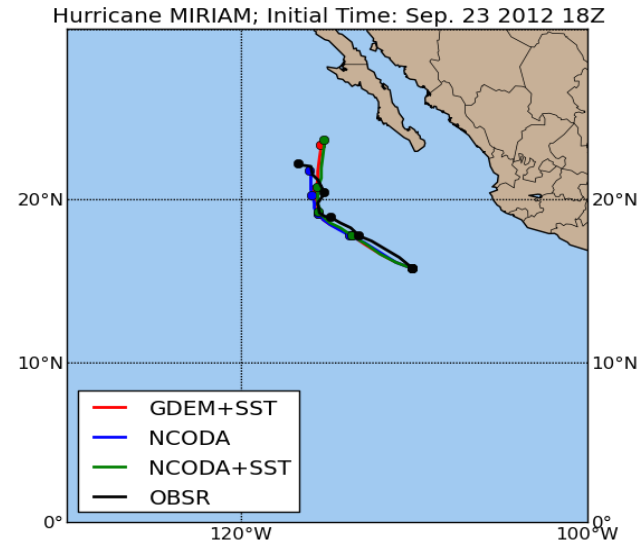


Evaluation of Ocean Initialization Options: Impact on Hurricane Forecasting: Miriam (2012)

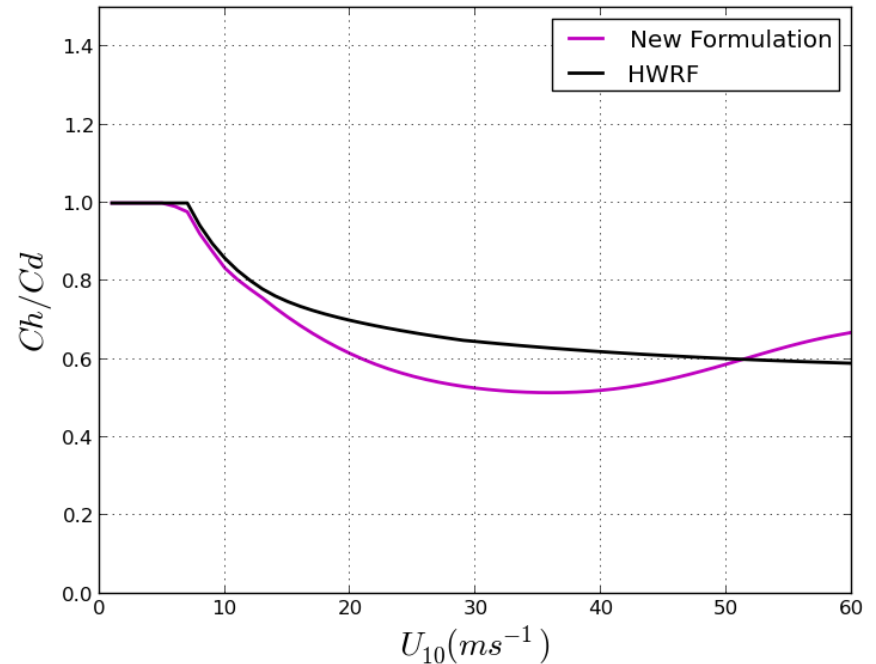
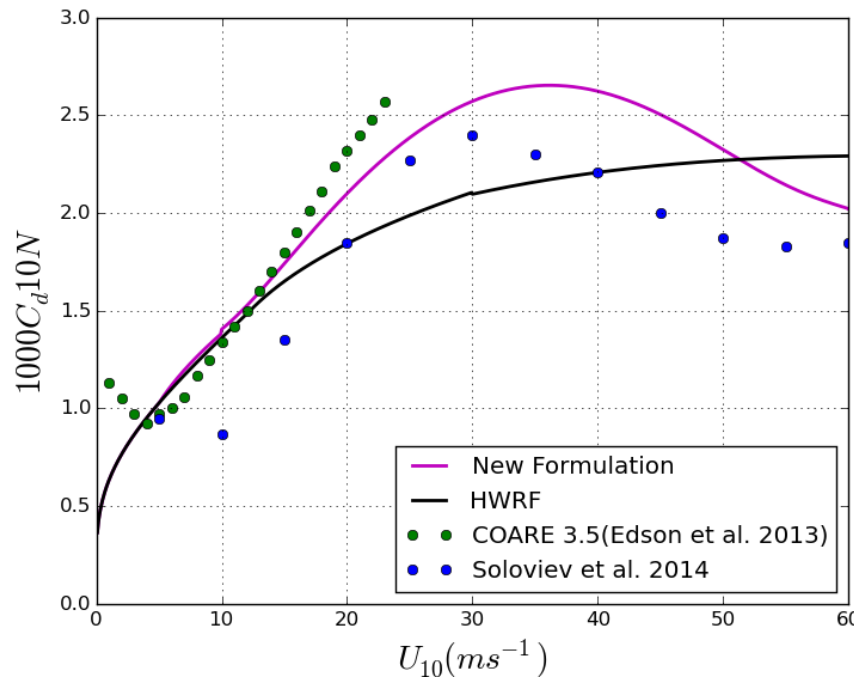
September 22 12Z



September 23 18Z

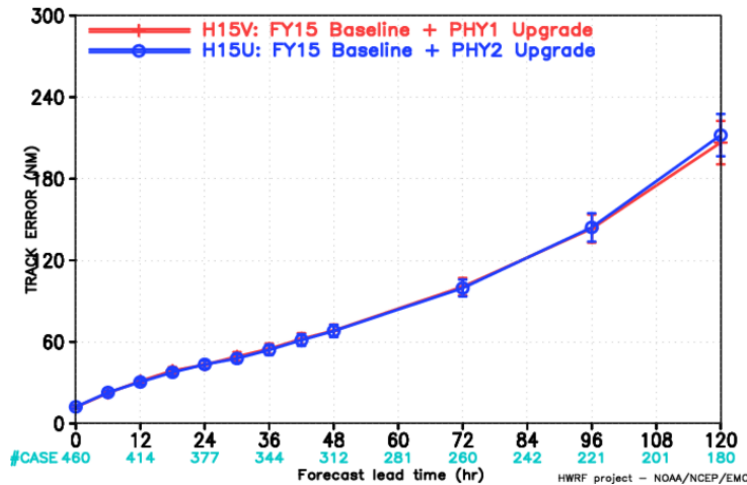


New C_d formulation implemented in GFDL and HWRF Hurricane Models

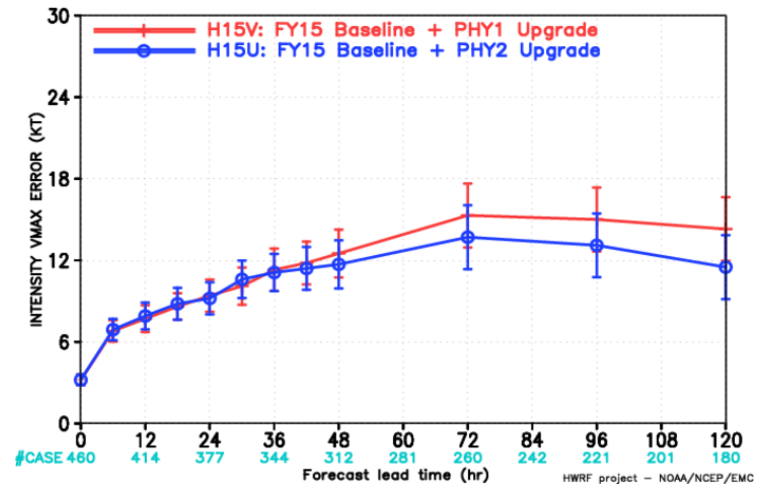


Impact of new Cd on HWRF Forecasts

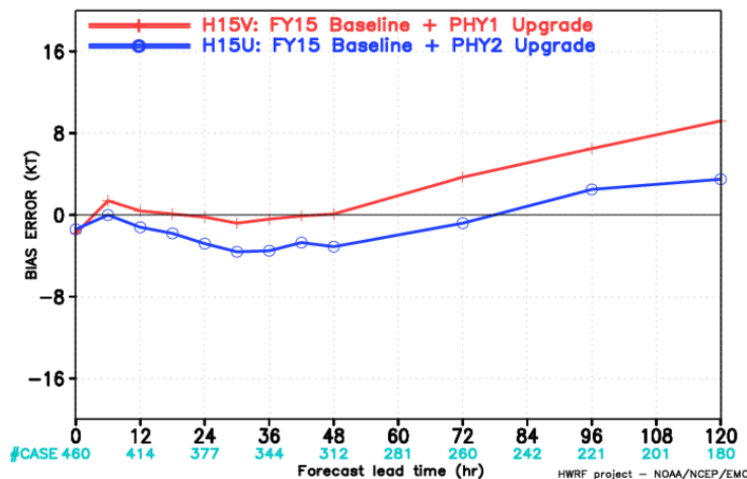
HWRF FORECAST — TRACK ERROR (NM) STATISTICS
VERIFICATION FOR NTAL BASIN 2011–2014



HWRF FORECAST — INTENSITY VMAX ERROR (KT) STATISTICS
VERIFICATION FOR NTAL BASIN 2011–2014



HWRF FORECAST — BIAS ERROR (KT) STATISTICS
VERIFICATION FOR NTAL BASIN 2011–2014



H15V: Old (2014 operational) Cd
H15U: New Cd

Source: Zhan Zhang, NCEP/EMC

Summary

- MIPOM is updated with new capabilities: computational domain is designed to be relocatable to regions around the world with flexible initial condition modules.
- Current ocean initialization options include: feature-based (GDEM+SST), NCODA and HYCOM daily products.
- Evaluation of different initialization conditions and ocean response is conducted against AXTB measurements in Hurricane Edouard (2014).
- Use different ocean initializations in the GFDL model shows a potentially significant impact on storm intensity
- A new drag coefficient formulation was tested in HWRF and yielded a positive impact on storm intensity. It is being evaluated for operational implementation in 2015.