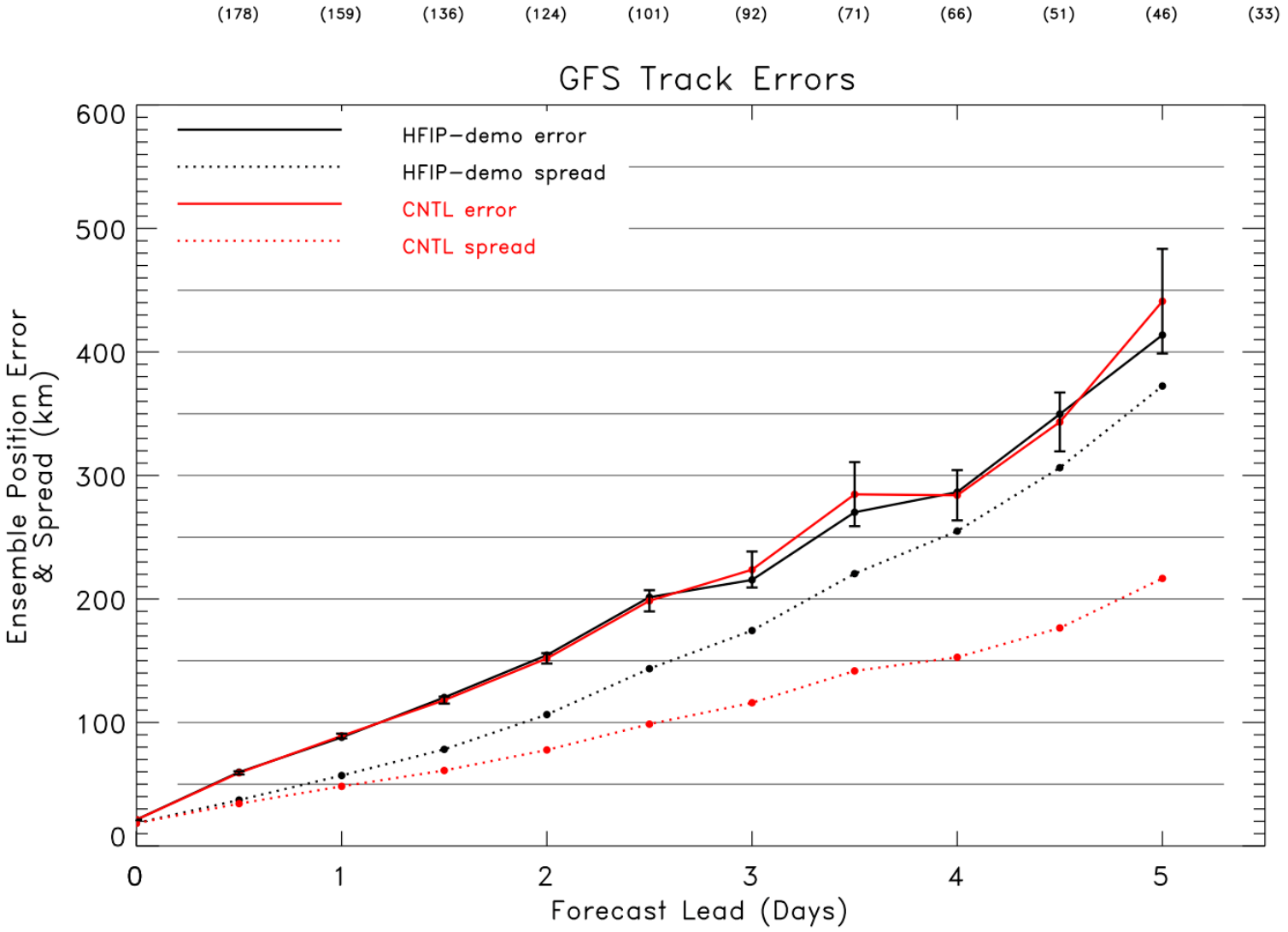
How to improve ensemble forecasts?

- Improve the forecast model (duh).
- Improve the representation in initial condition uncertainty.
  - Hybrid ensemble-Var or EnKF assimilation.
  - Mainly will affect shorter leads (0-3 days).
- Improve the representation of model uncertainty.
  - Stochastic and scale-aware physics.
  - Will also improve IC uncertainty thru improved background-error cov in DA.
  - Ocean uncertainity?

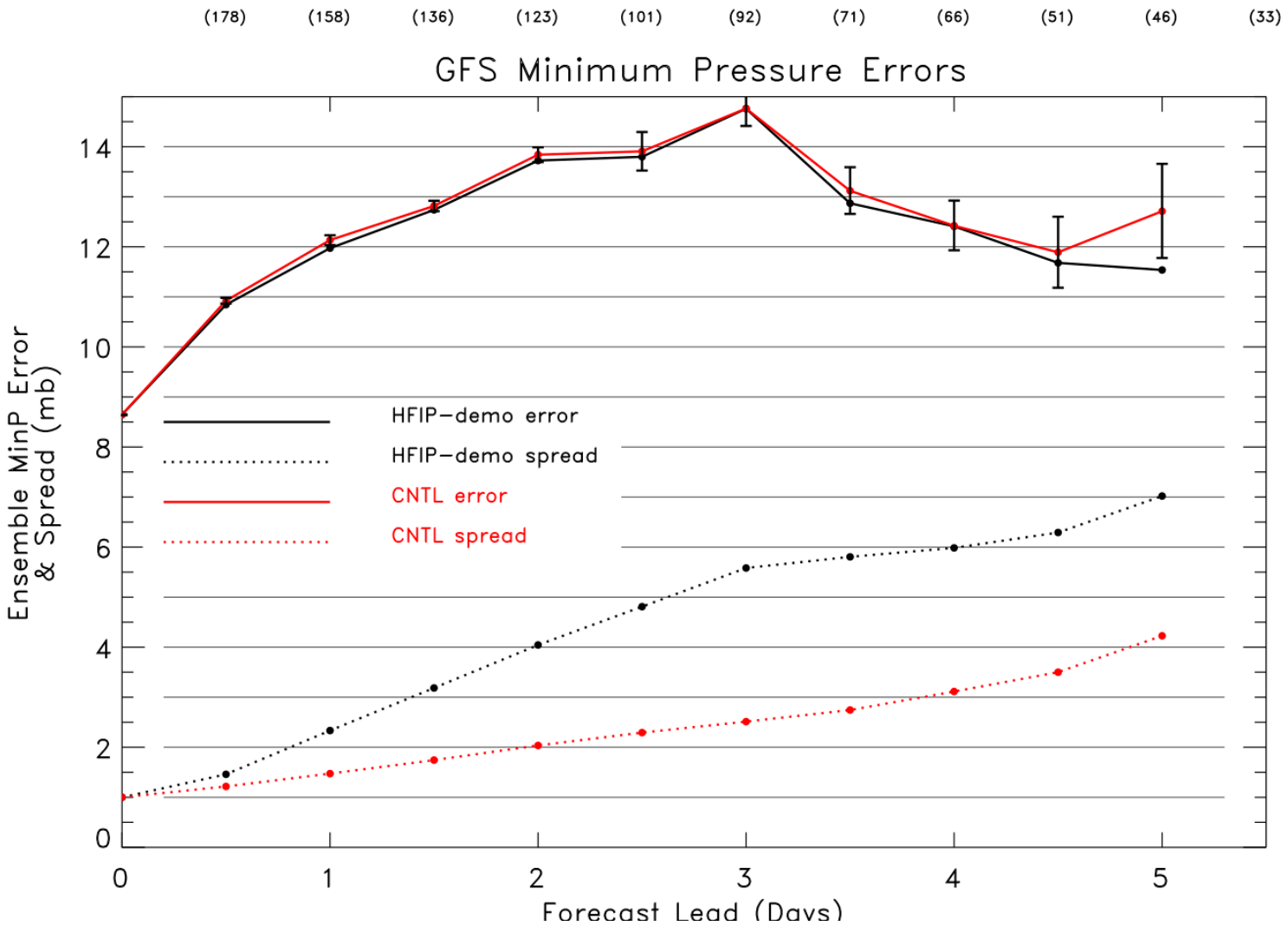
Paths forward

- Continue to improve ensemble DA systems
  - Better representation of initial condition uncertainty.
- Push representation of model uncertainty down to process level
  - So process understanding and observations can be leveraged.
- Leverage ensemble DA and forecast system to improve model
  - In ensemble DA there is a very strong feedback between the model and the analysis (& forecasts).

Impact on stochastic physics on track error/spread (GFS)

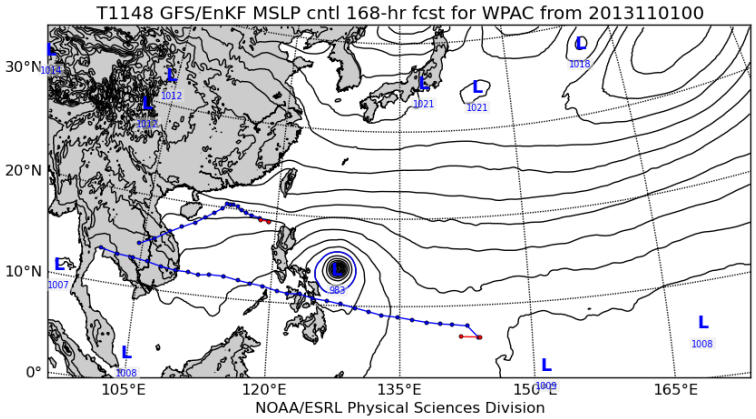


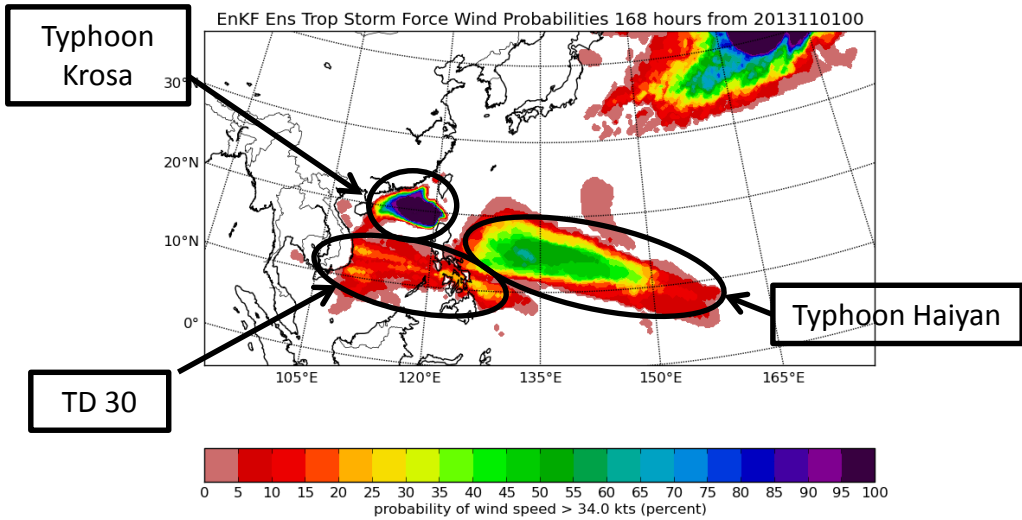
Impact on stochastic physics on intensity error/spread (GFS)



7-Forecast of Typhoon Haiyan

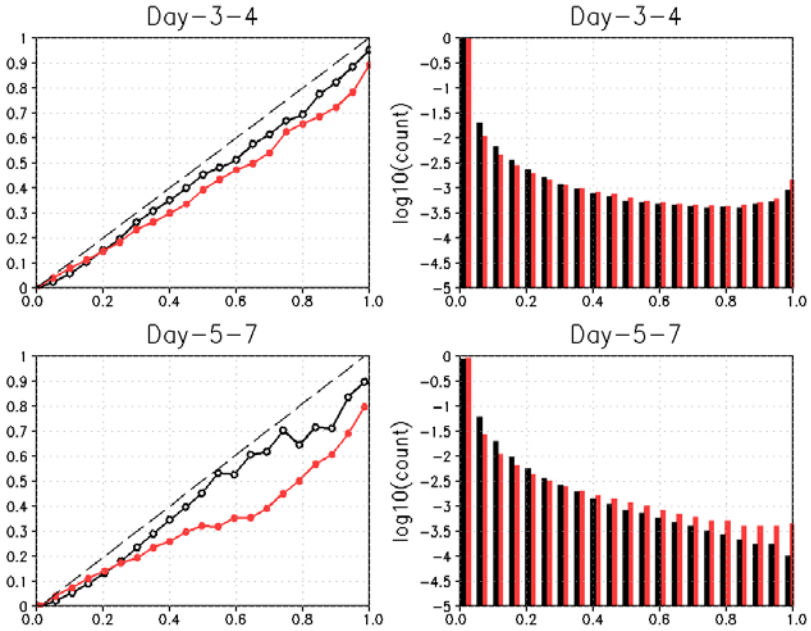
Haiyan at validation time:
Position: 8.6ºN 132.8ºE
minp: 911 mb
maxw: 150 kts



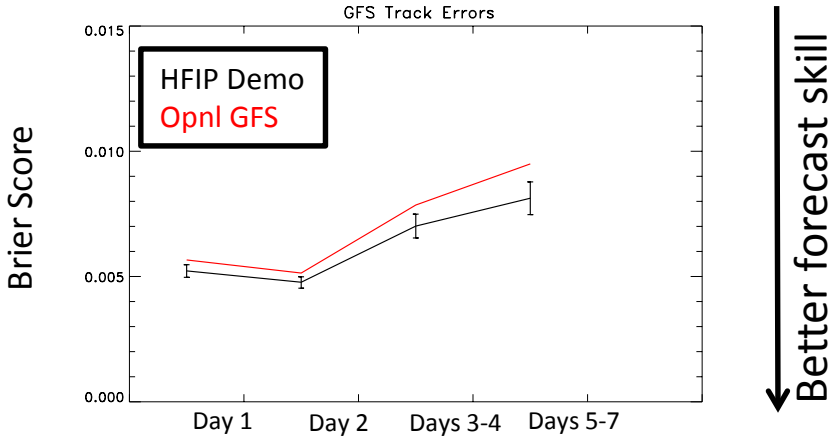


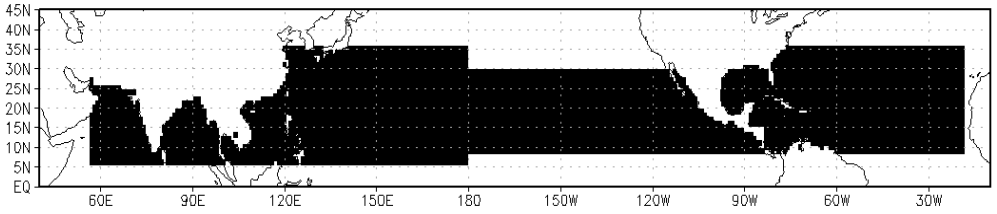
This forecast was initialized 18 hours before Haiyan was classified as an invest, and 48 hours before it was classified as a depression.

Probability of winds of tropical storm strength or greater



Brier Skill of Probabilistic Wind forecast >34kts





Probabilities are computed on a 1x1-degree. Reliability and Brier Scores are aggregated over domain shown on left