Sensitivity of Different Types of Observations to NASA GEOS Hurricane Analyses And Forecasts

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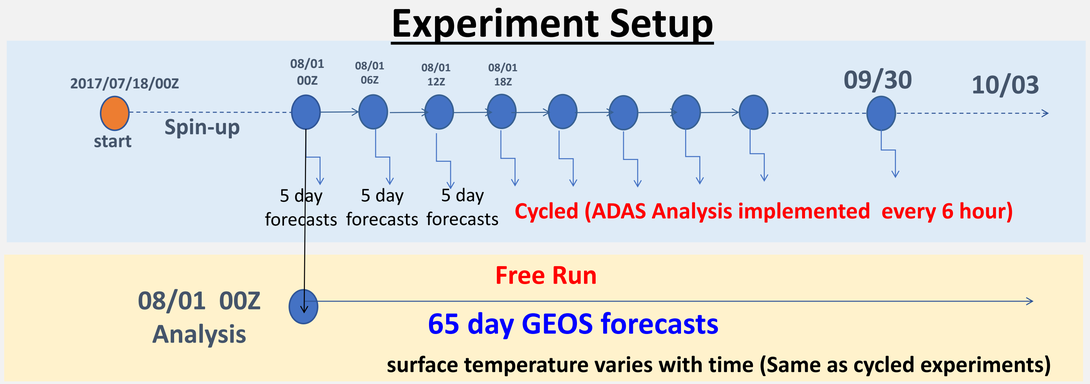
Poster number?

Objectives

- The 2017 Atlantic hurricane season was the 5th most active, featuring 17 named storms, the highest number of major hurricanes since 2005, and by far the costliest season on record.
- **To examine impacts of different types of observation data on NASA Goddard Earth Observing System (GEOS) model hurricane analyses and forecasts during the period of 2017 summer**, this study performs data denial experiments using GEOS Atmospheric Data Assimilation System (ADAS), which is based on the hybrid 4D-EnVar GSI algorithm.
- Various types of observations such as microwave sounders, infrared sounders, TCvitals, and conventional data are removed in the experiments.
- In addition, the interaction between the different observation groups as certain instruments are removed from the analysis is investigated in detail using adjoint based forecast sensitivity observation impact (FSOI)

Experiment Setup



- GEOSadas_5-18-3_OPS tag (used for f516 fp)
- Data assimilation algorithm: Hybrid 4D-EnVar
- 0.25˚ (forecast). 0.5˚ (analysis) horizontal resolution,n72 vertical levels
- NoMW and NoIR experiments: Ensemble backgrounds are replayed using Control.

❑ **Control**: Conventional, Tcvitals, AMSU-A, MHS, ATMS, AIRS, IASI, Crls, HIRS, SBU2, SEVIRI, GPSRO, GOES-Sounder are assimilated.

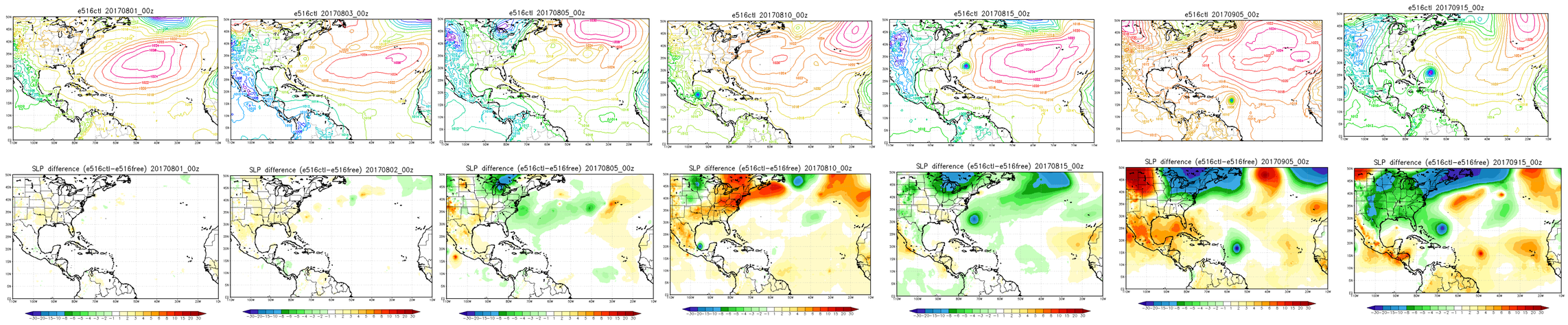
❑ **NoMW**: Not assimilating data from microwave sensor (AMSU-A, ATMS, MHS)

❑ **NoIR**: Not assimilating data from IR sounders (AIRS, IASI, and Crls)

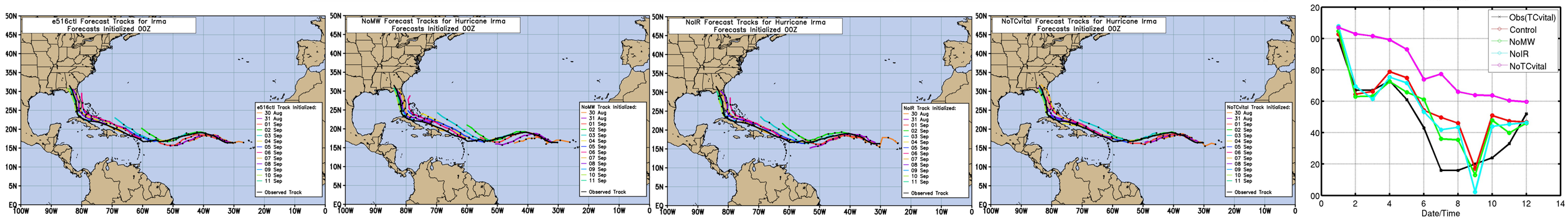
❑ **NoTCVital**: Not assimilating TCvital data

❑ **Free Run**: No data are assimilated

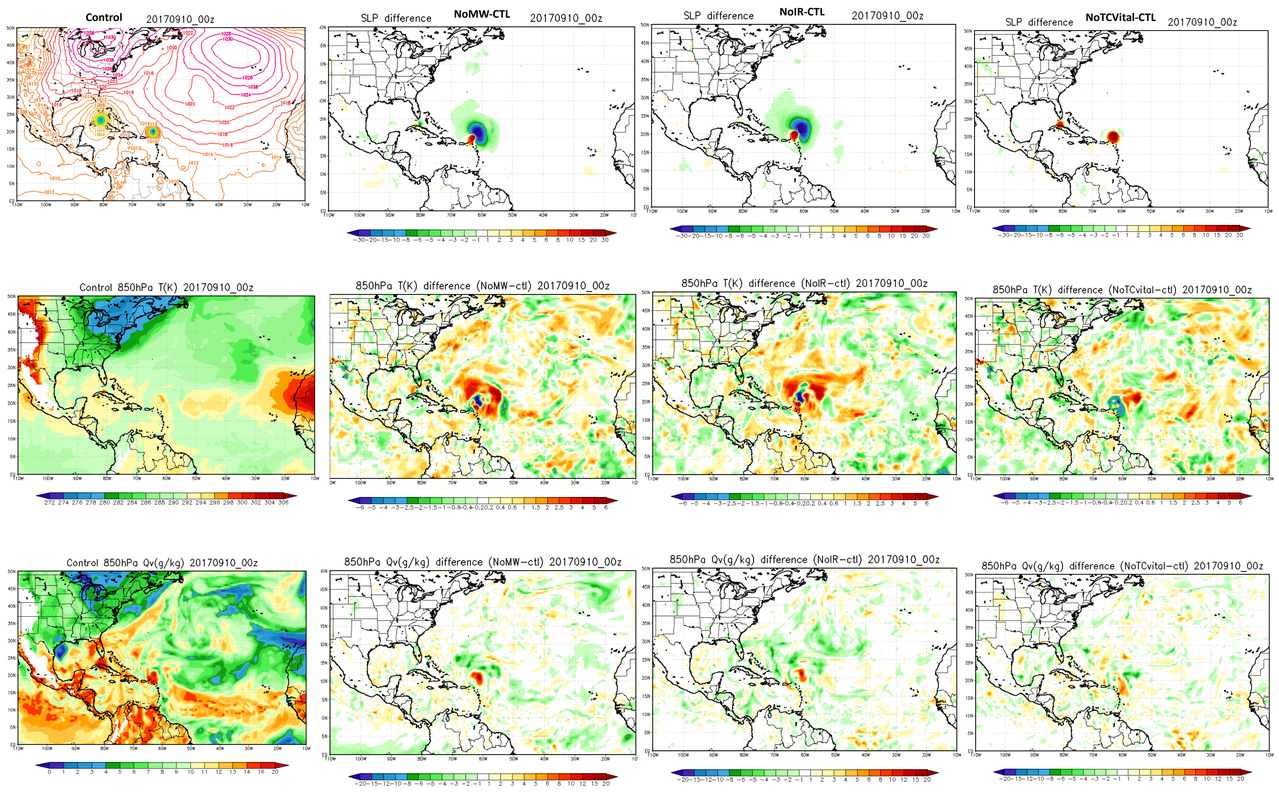
Control vs. Free Run : Sea Level Pressure (SLP)



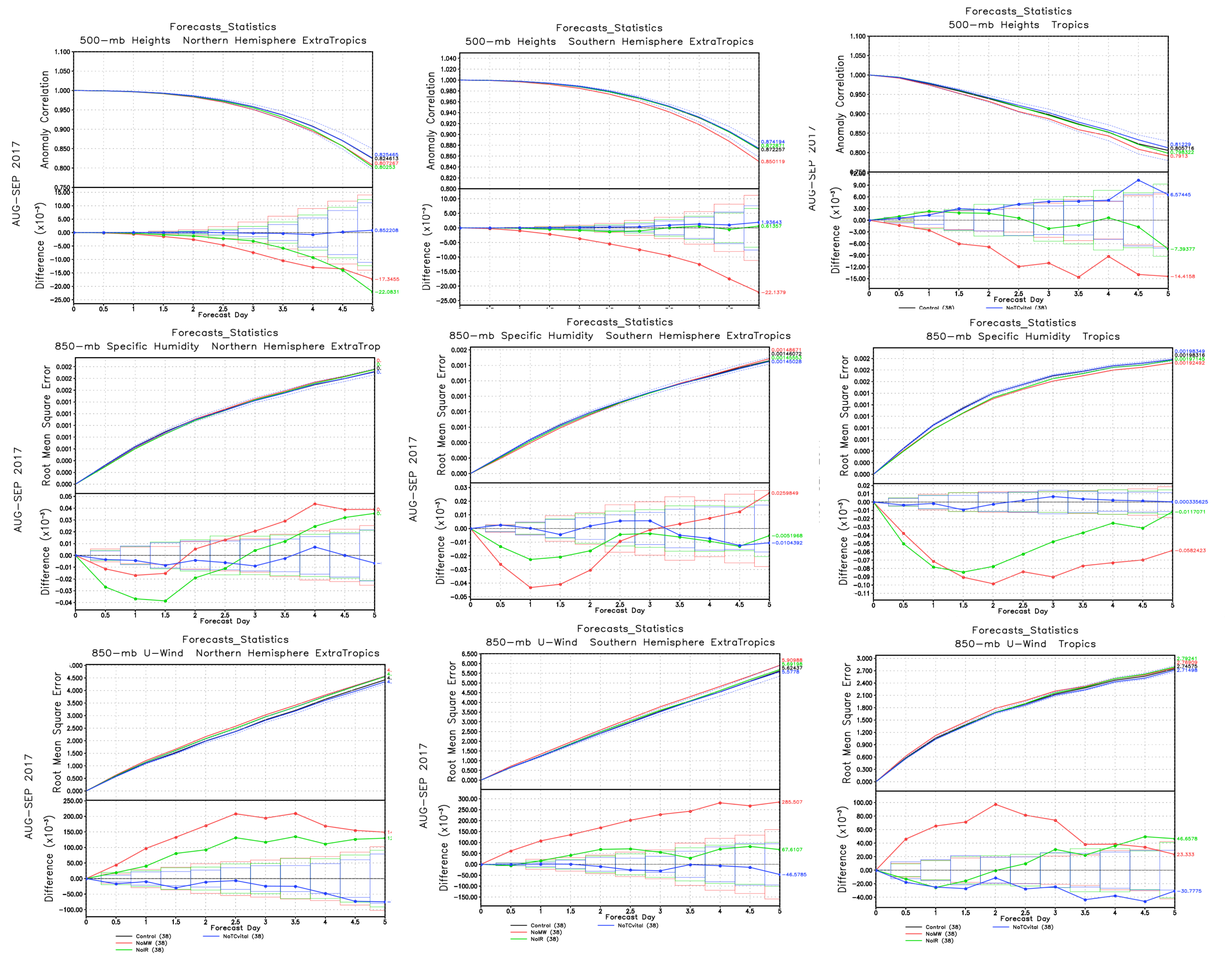
Comparisons of Hurricane Track and Intensity Forecasts (Hurricane Irma)



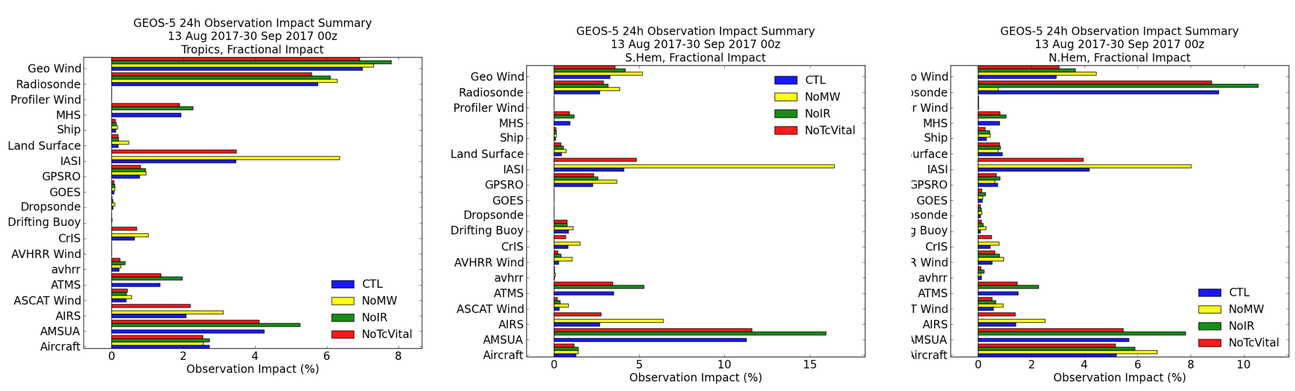
Comparisons of Control, NoMW, NoIR, and NoTCvital



Comparisons of 5-day Forecasts Skill



Forecast Sensitivity Observation Impact



Summary & Discussion

Assimilating observations for better analyses is important for hurricane analysis and forecasts: (1) Conventional data seems most critical to analyze pressure systems and waves patterns that link to formation and propagations, (2) Satellite radiance data seem improving hurricane tracks by analyzing detailed humidity and temperature distributions over ocean.

(3) TCvital data seem to help hurricane intensity analysis and forecasts rather than hurricane track forecasts. (4) Looking at impacts of all-sky microwave radiance data assimilation on hurricane analyses and forecasts . (5) NoMW show largest degradation in GEOS forecast skills