Impact of Uncertainty in NWP Background T/P on L2B Retrieval of Rayleigh Winds

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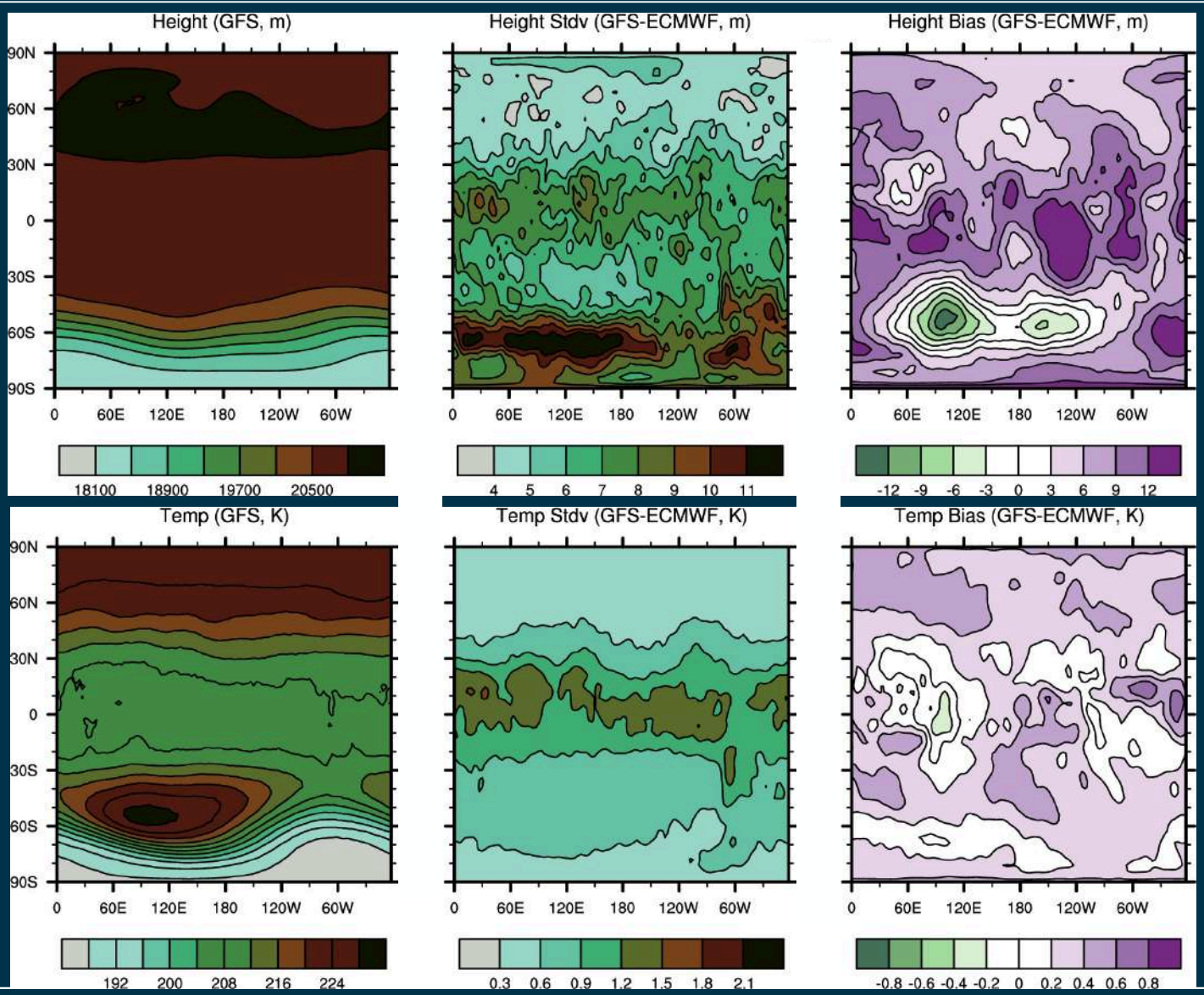
Objectives

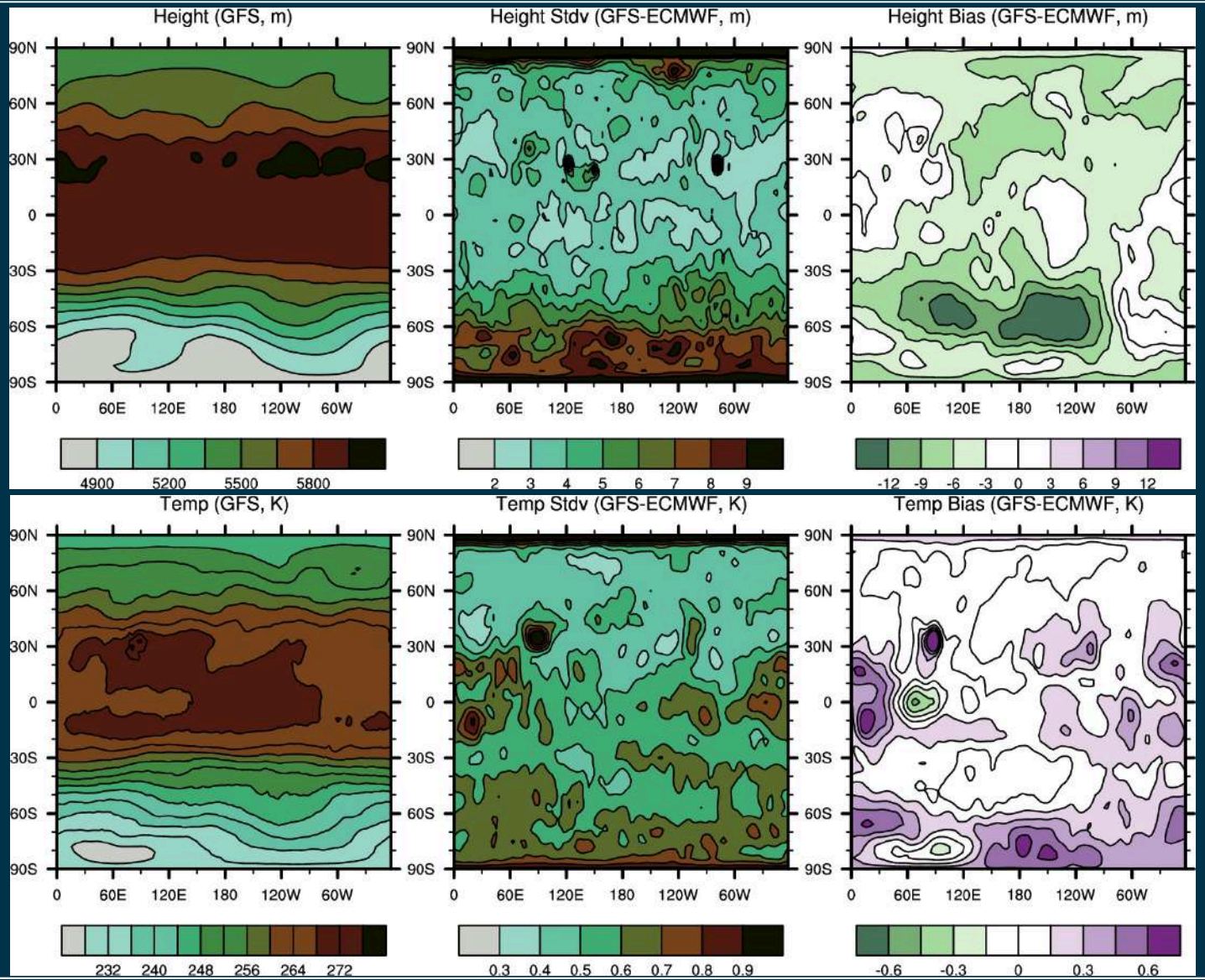
- Explore potential impact of uncertainty in NWP T/P background on Aeolus L2B Rayleigh winds
- Account the errors properly to optimize Aeolus assimilation and its impact on NWP

Height/Temp Background on 50 hPa (FV3GFS vs. ECMWF)
(Aug 2-30, 2019)



- Height on pressure level
- Large uncertainty in NWP height/pressure in the Southern Hemisphere
- Temperature on pressure level

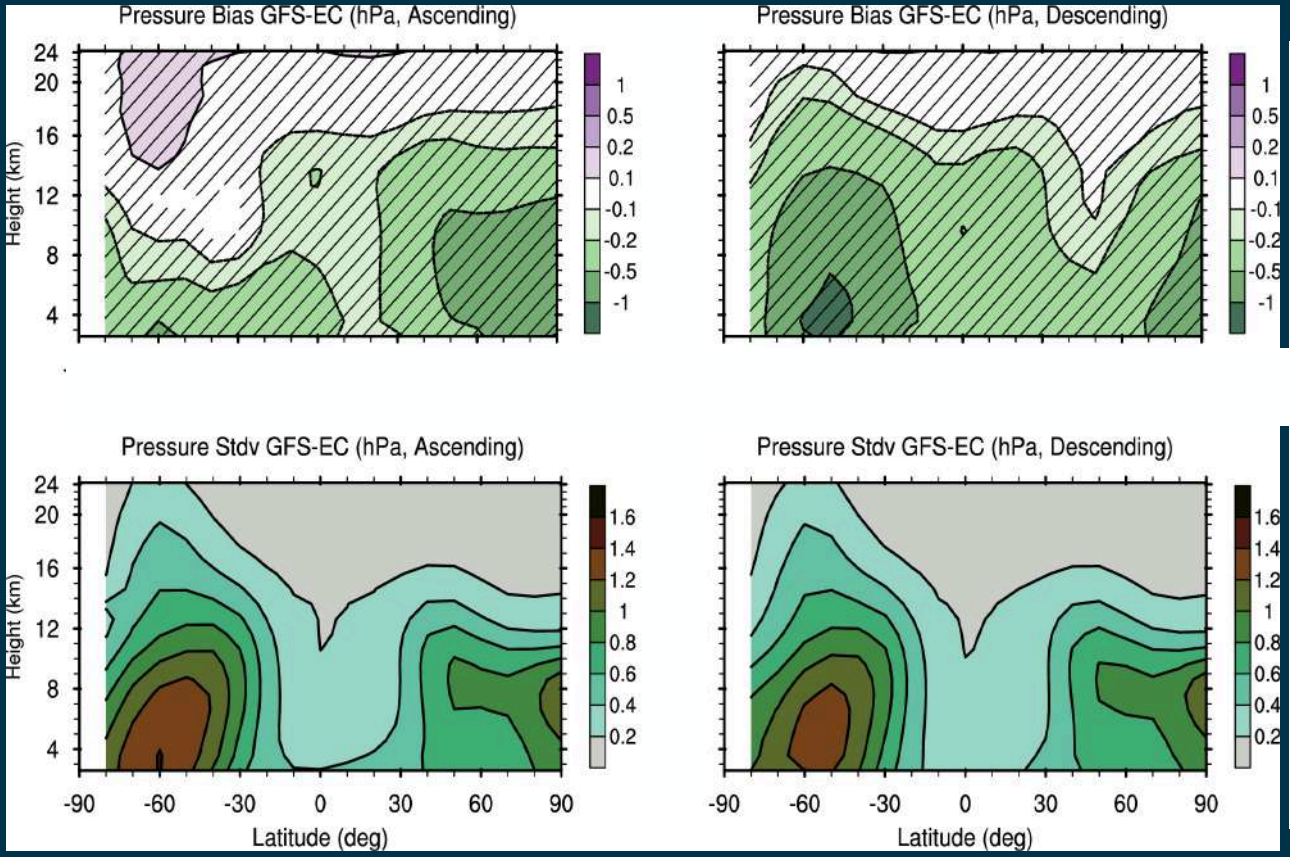
Height/Temp Background on 500 hPa (FV3GFS vs. ECMWF)
(Aug 2-30, 2019)

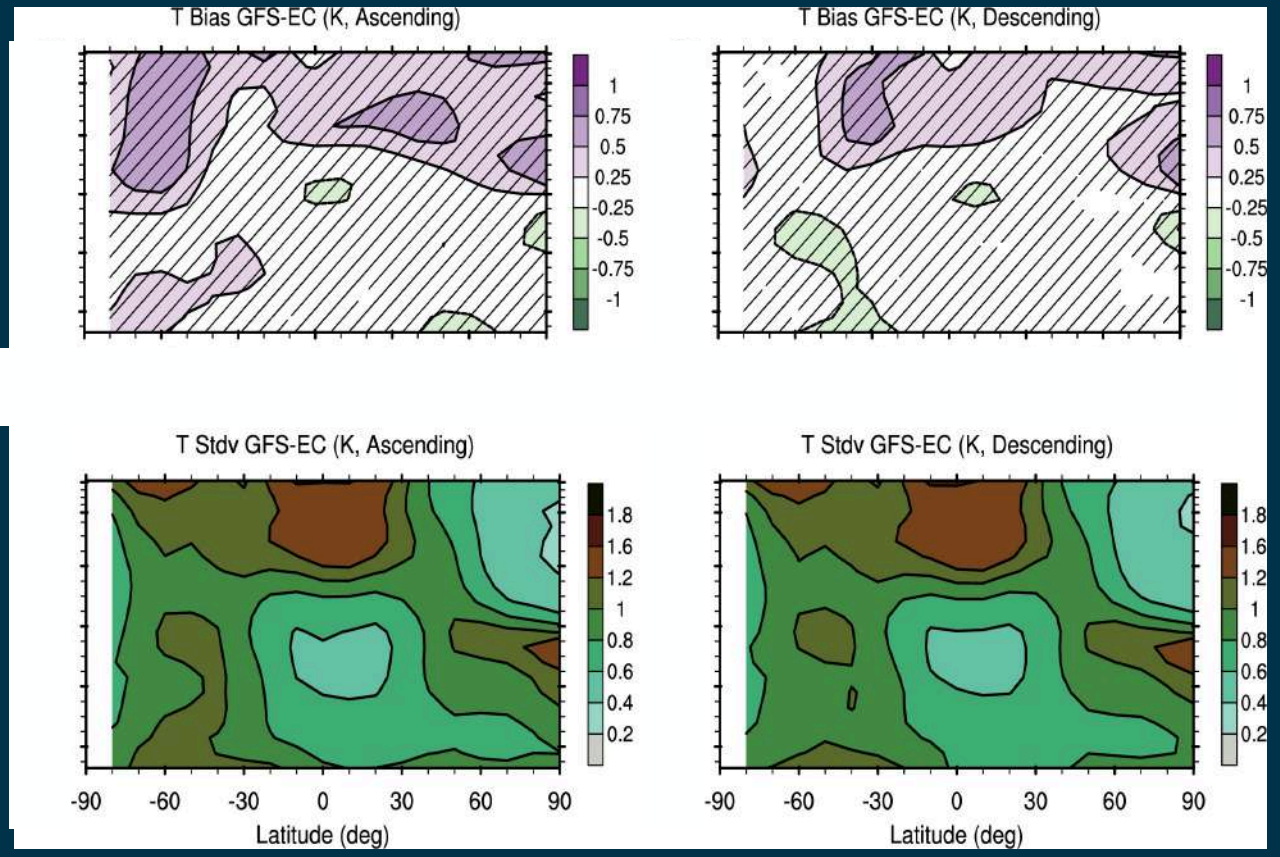


- Height on pressure level
- Large uncertainty in NWP height/pressure in the polar regions
- Temperature on pressure level

Differences in P/T Background (FV3GFS – ECMWF)
(Aug 2-30, 2019)

Pressure (shaded: >95% confidence level) Temperature





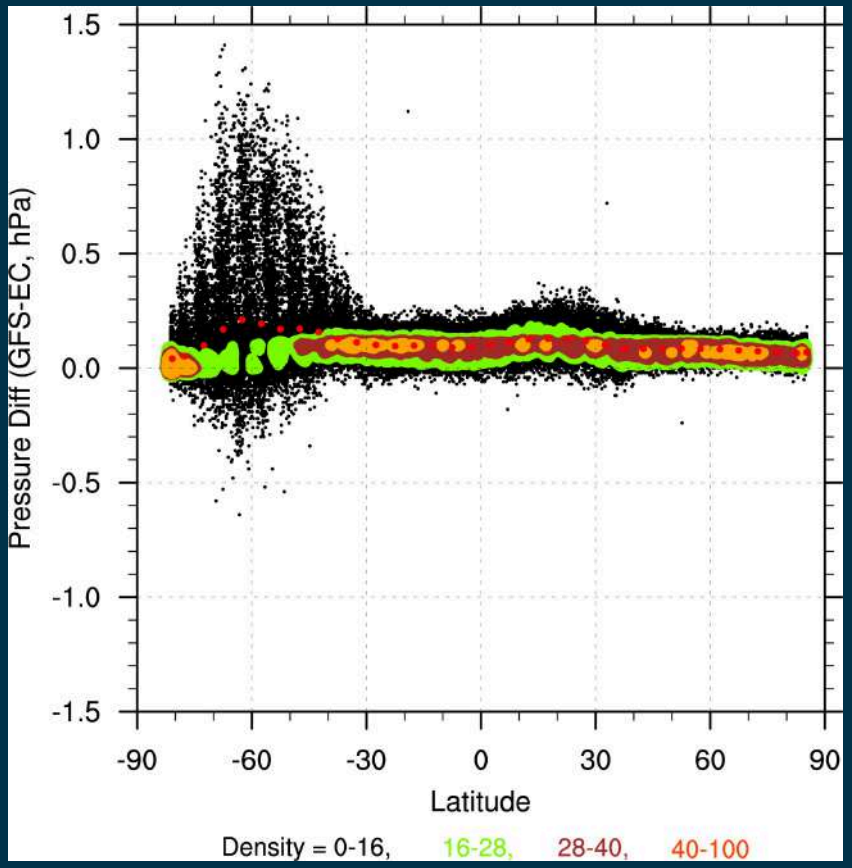
L2B Processing Experimental Setup

- Duplicate ESA operational L2B processing (v3.30) using T/P backgrounds from NOAA FV3GFS (25km/L64, AE_NOAA_AUX_MET_12)
- Operational L1B Aeolus data and other parameter settings
- The Rayleigh wind retrievals are compared to the ones using ECMWF T/P background (AE_OPER_AUX_MET_12)
- Aug 2 – 30, 2019 is examined

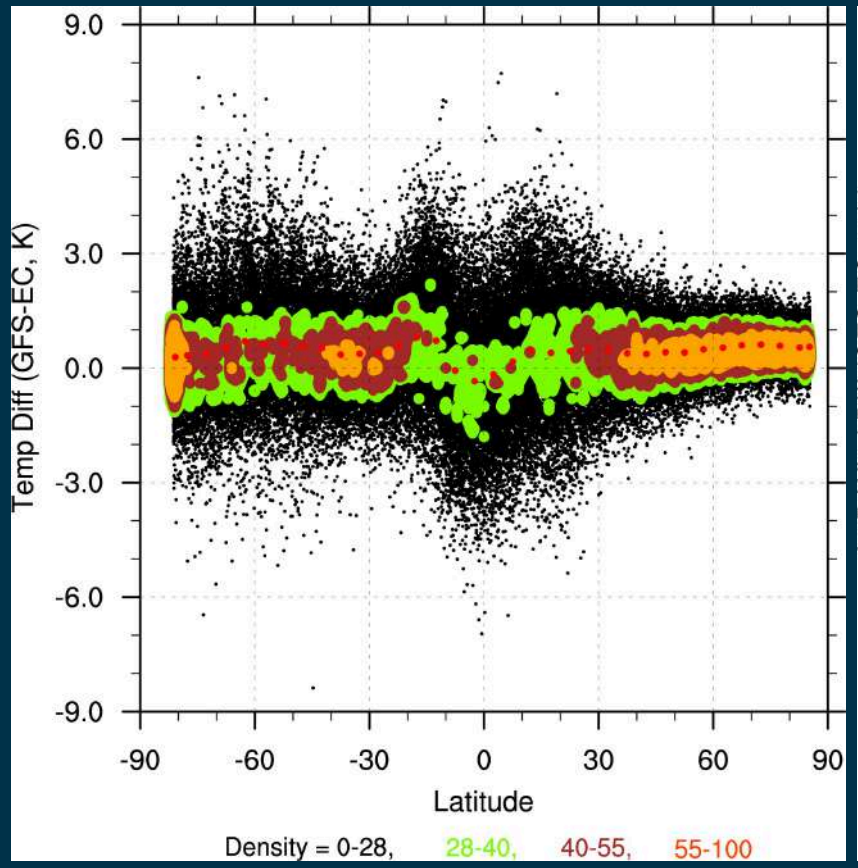
Differences in P/T and Rayleigh Winds (FV3GFS – ECMWF)

(24km altitude, Aug 2-30, 2019, Ascending)

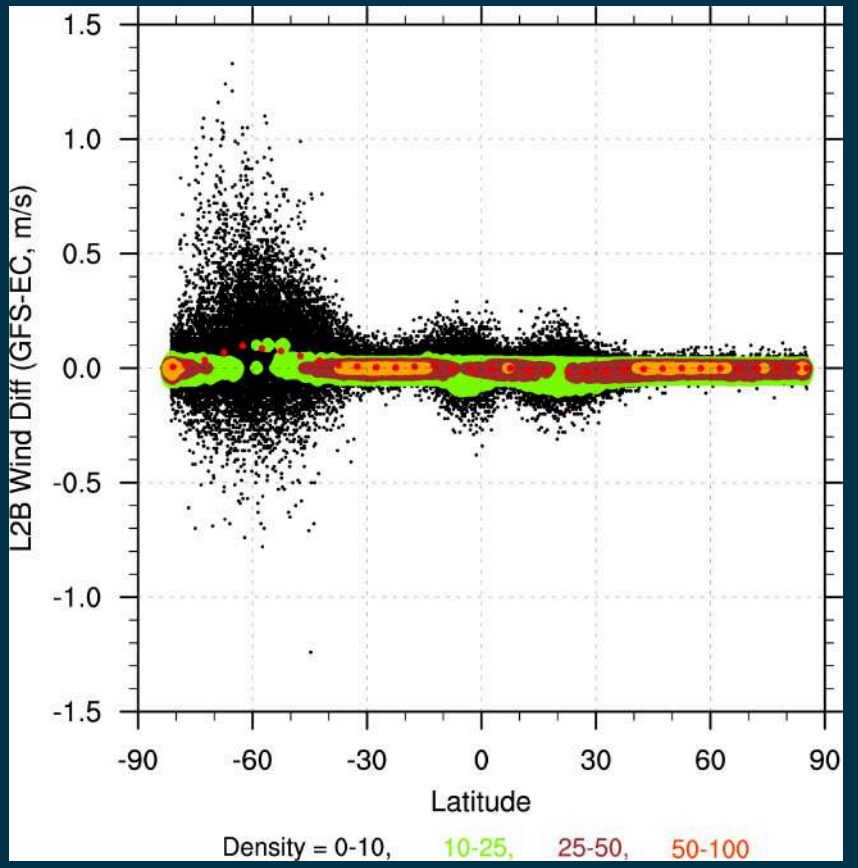
Pressure



Temperature



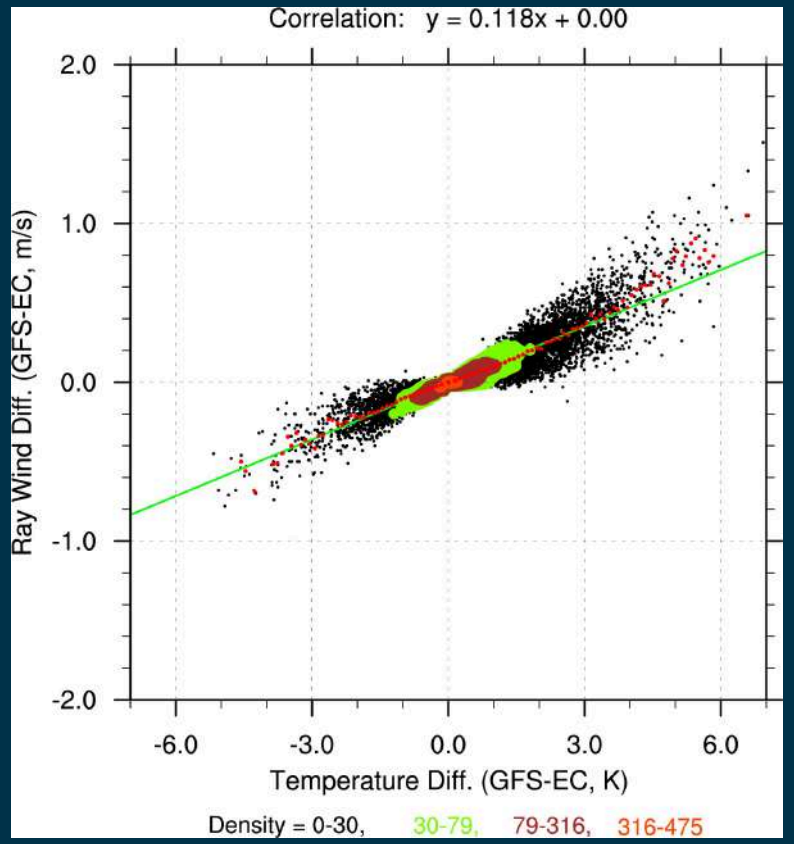
Rayleigh Winds



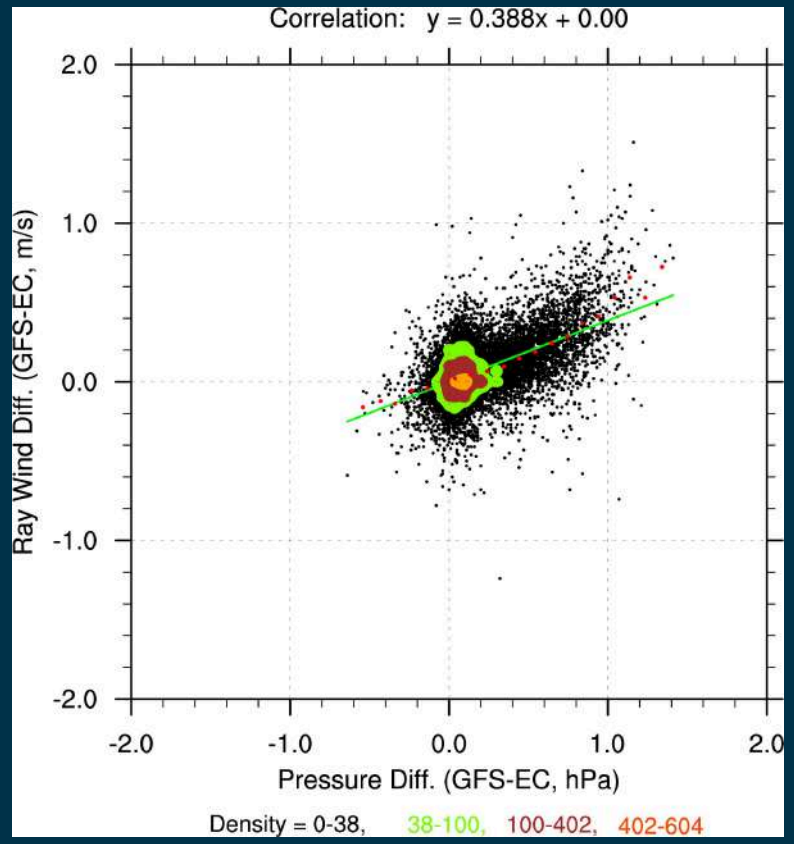
Differences in P/T and Rayleigh Winds (FV3GFS – ECMWF)

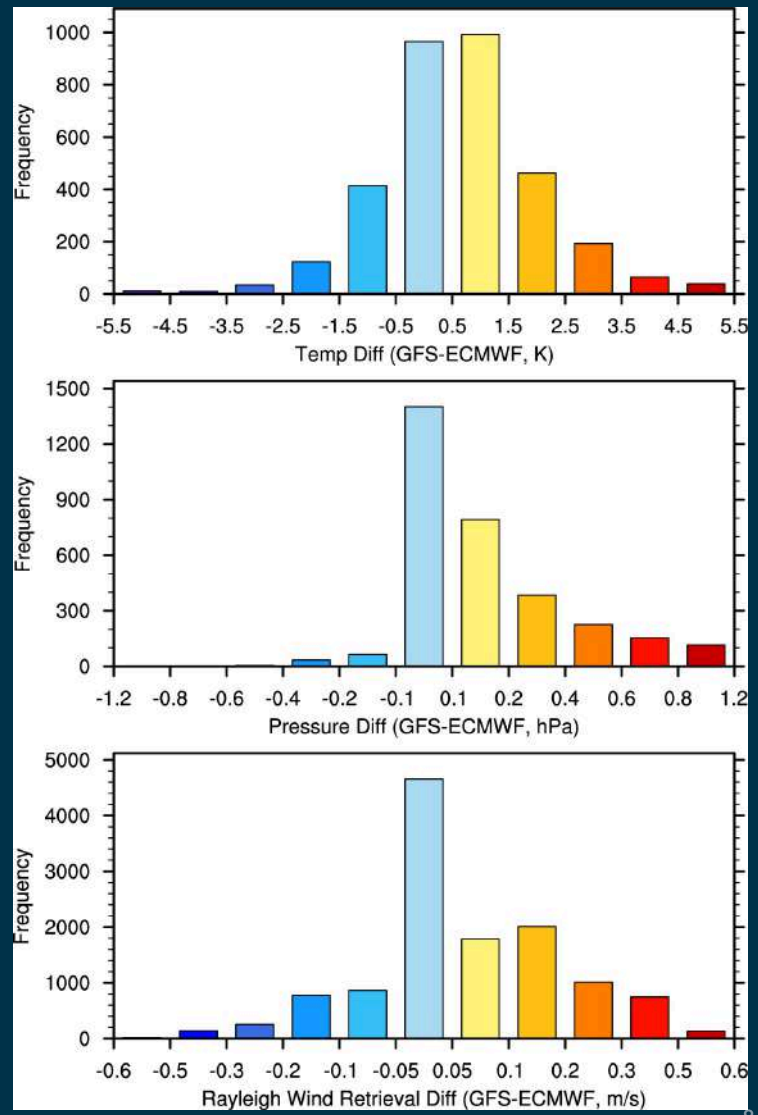
(24km altitude, 30S-90S, Aug 2-30, 2019, Ascending)

Rayleigh vs. Temp



Rayleigh vs. Pressure

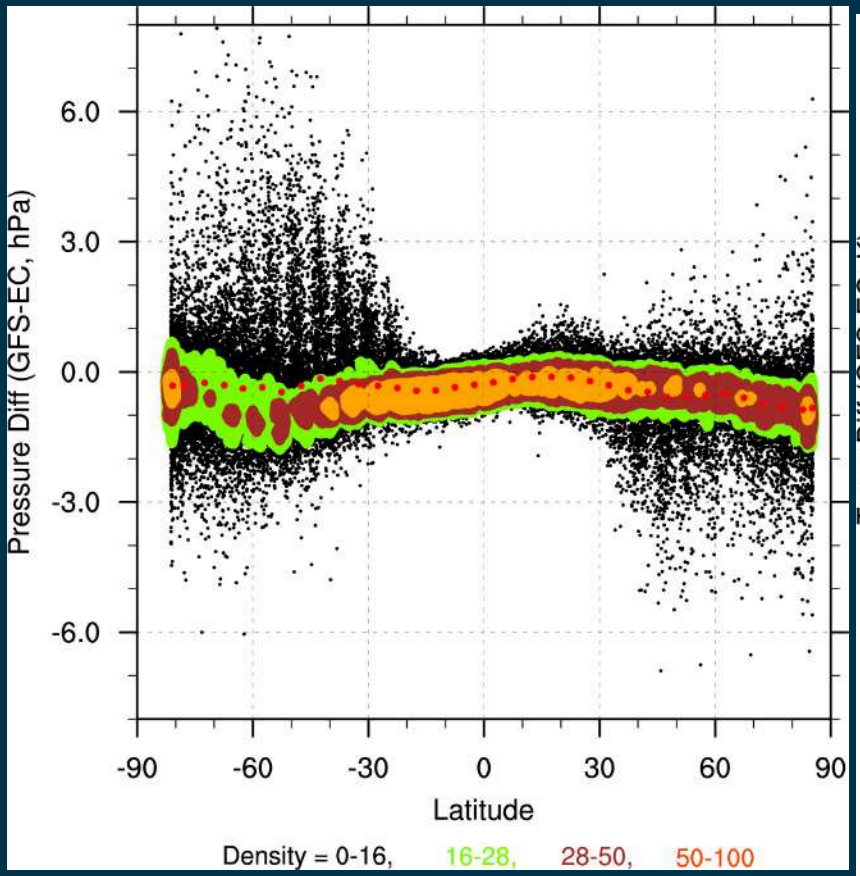




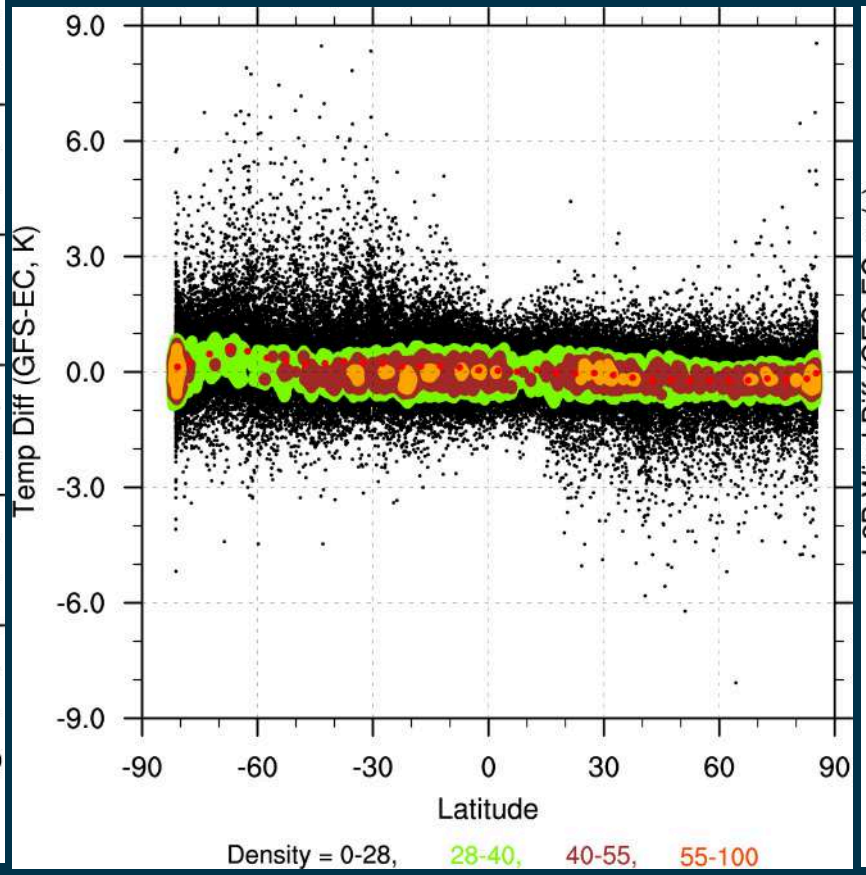
Differences in P/T and Rayleigh Winds (FV3GFS – ECMWF)

(5km altitude, Aug 2-30, 2019, Ascending)

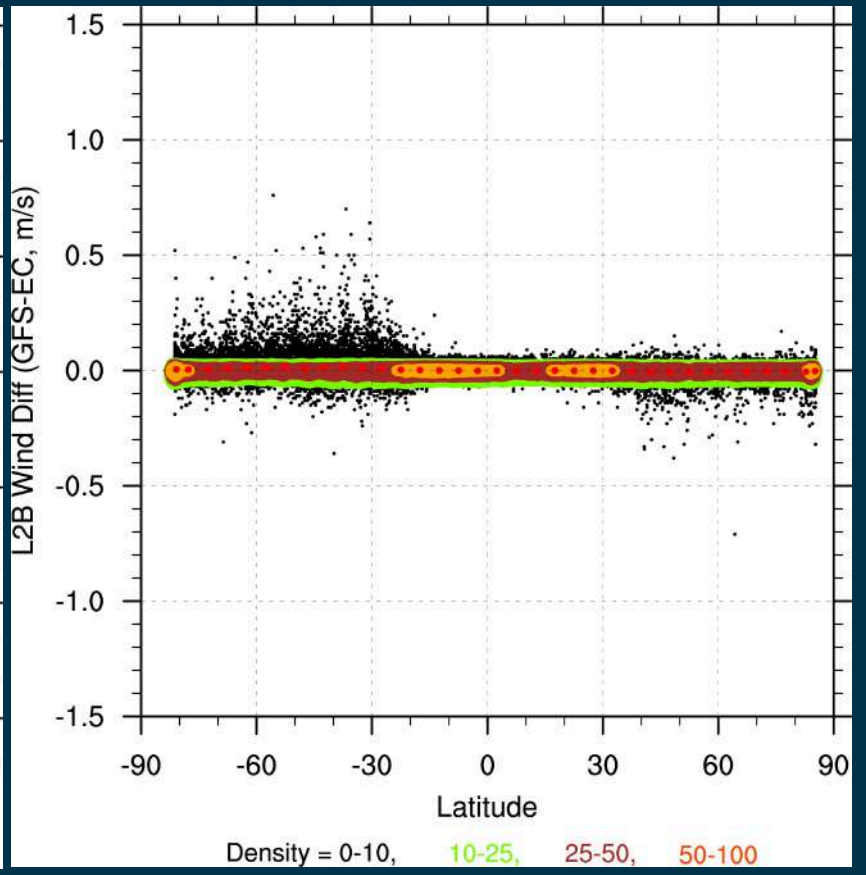
Pressure



Temperature



Rayleigh Winds



Summary and Comments

- NWP pressure and temperature show evident uncertainty especially in the lower stratosphere of the Southern hemisphere and polar regions.
- L2B Rayleigh wind retrievals show sensitivity, up to 0.5-1 m/s, to the uncertainty in NWP background T/P.
- Moderate positive correlation between Rayleigh winds and P/T differences.
- Small biases in Rayleigh winds are also noticed.

- L2B Rayleigh wind uncertainty to take account of this error source?

- Plan to explore impact of the error/uncertainty in Rayleigh winds on Aeolus assimilation with GFS model.

- **Acknowledgement:**

  Thanks Jos de Kloe for his great help with running the L2B processing package at NOAA.