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# NOAA

IROWG-10 September 13, 2024

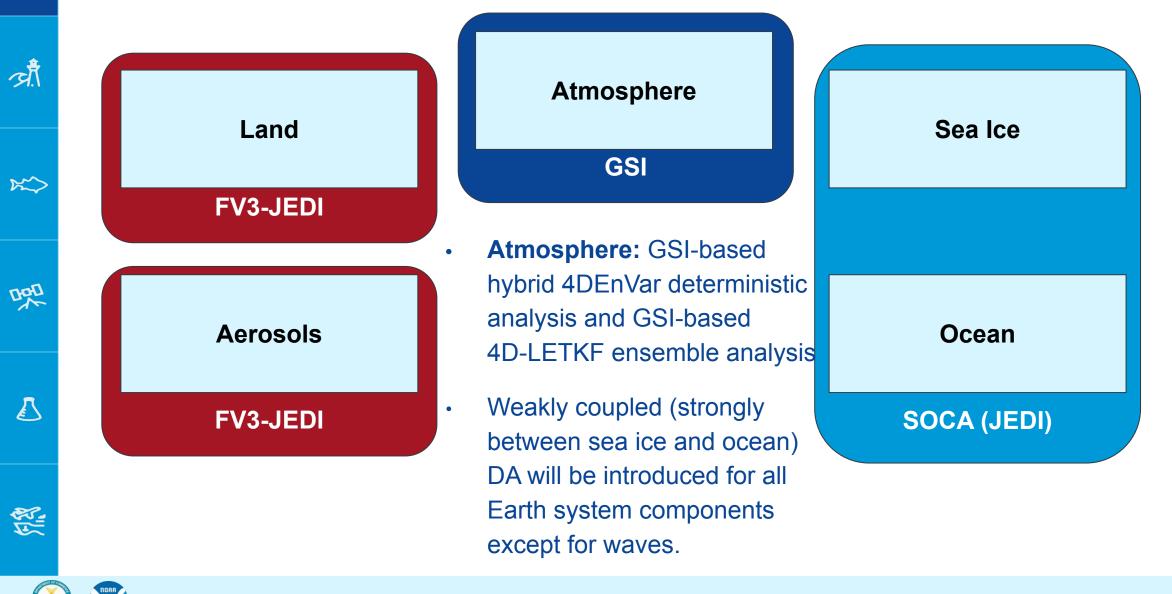


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 <sup>3</sup> Lynker @ NOAA/NWS/NCEP/EMC
 <sup>4</sup> NOAA/OAR/QOSAP
 <sup>5</sup> UCAR/CAPESS@OAR/ORTA/QOSAP



# 答 GFS v17 New Coupled DA



## **ROMEX Experiments with GFSv17**

- Global parallel experiments using GFSv17
- 80 ensemble members, half resolution C384 (25 km) + C192
- Thompson microphysics scheme employed in model forecast
- Noah-MP Land Surface Model
  - Model is not coupled
  - Atmosphere-only DA
  - Atmosphere DA has been updated to Thompson microphysics scheme, but was not available at the time of the experiments
  - Scale-Dependent Localization is not incorporated



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# **ROMEX Experiments**

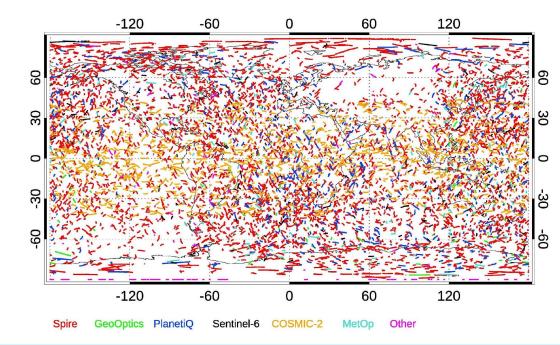
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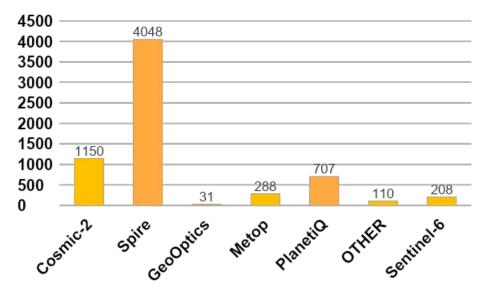
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- Verification: September 7 October 20, 2022
  - baseline: COSMIC-2, MetOp, Kompsat-5, TandemX, TerraSarX, PAZ, and Sentinel-6 (~7,000 profiles/day)
  - supplement: baseline data + Spire, GeoOptics, and PlanetiQ (~26,000 profiles/day)



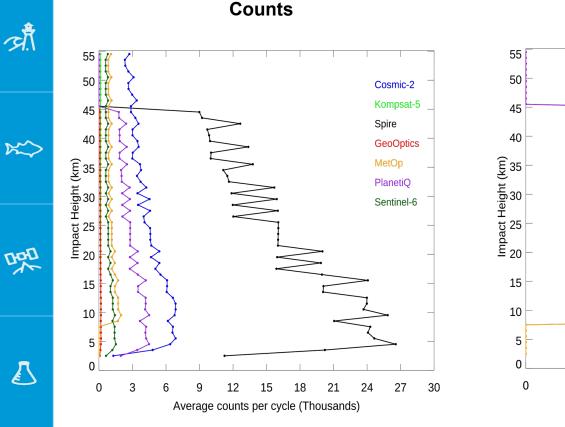
#### 00 UTC 20220904

#### Average number of profiles per cycle: Total RO 6,542



# Data Quality

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Percent of obs passing QC

60

Percent of Obs (%)

80

100

Cosmic-2

Kompsat-5

GeoOptics

Spire

MetOp

20

PlanetiQ

Sentinel-6

40

- From the supplement experiment
- GSI: Stricter statistic QC for COSMIC-2 and commercial RO data utilizing smaller O-B/O threshold values results in a lower percentage of obs passing QC below 10 km and above 35 km
- MetOp: Rejected below 8 km
- Commercial data: Rejected above 45-km impact height

20220907 - 20221020



#### **Data Quality – OmB/B** ž

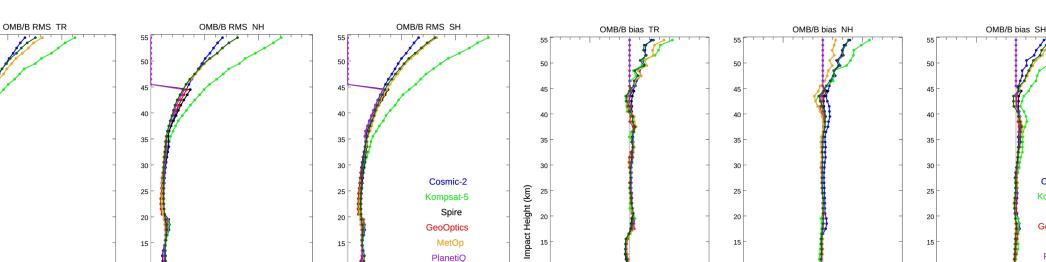
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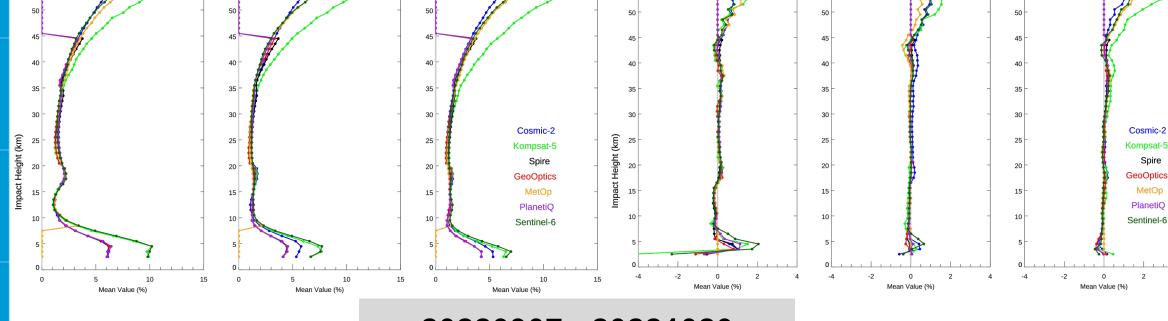
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RMS

**Bias** 

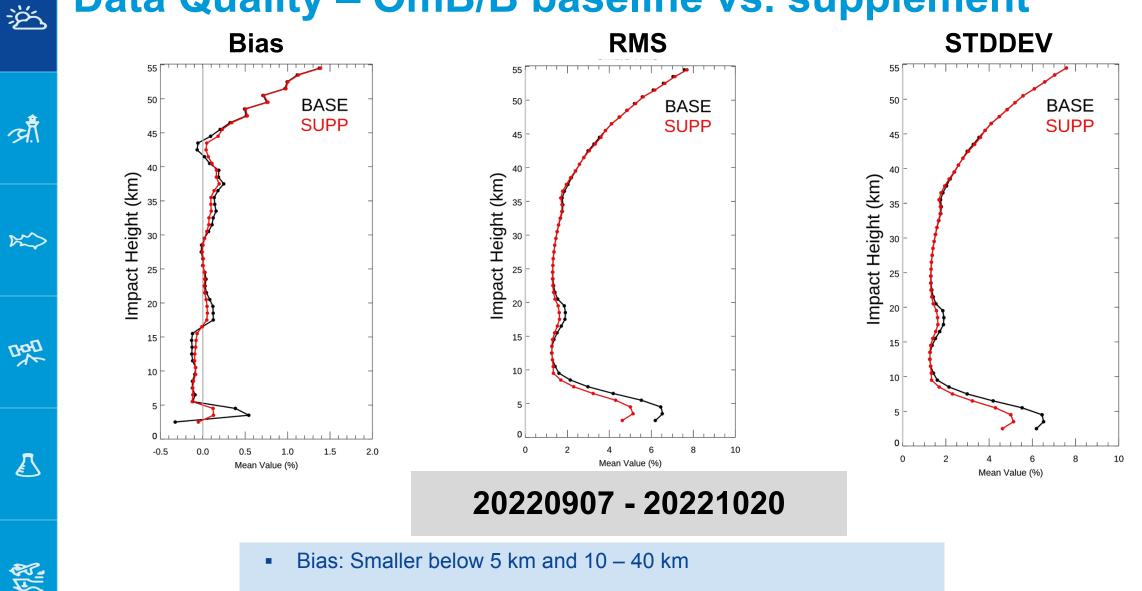


### 20220907 - 20221020

- Consistent with the past experiments using GFSv16
- Kompsat-5: Larger RMS and bias >35 km and <10 km
- Larger bias and RMS in Tropics <10 km for all missions

#### Sentinel-6: larger RMS and bias <10 km

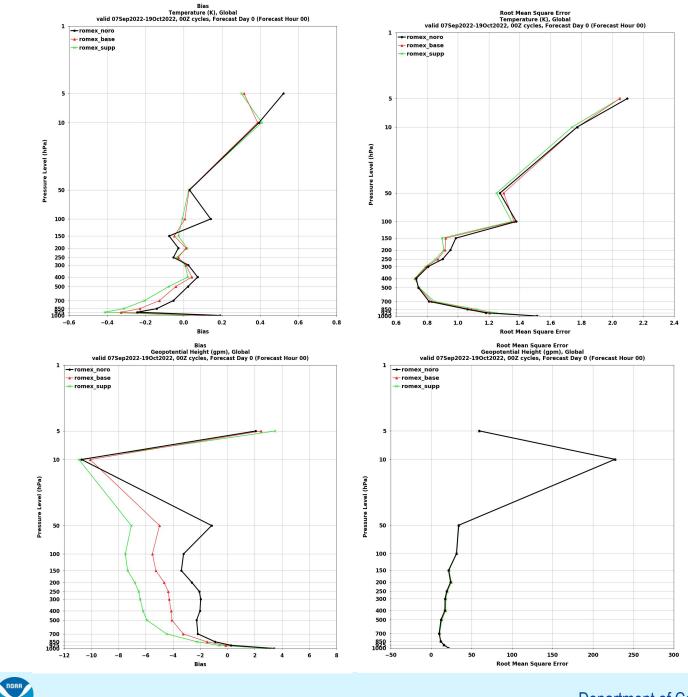
### **Data Quality – OmB/B baseline vs. supplement**



RMS and STDDEV: Smaller below 20 km

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### Data Impact – Fit to Radiosonde Data

- Cold bias in temperature and slightly larger RMSE at mid to low troposphere
- Slightly smaller RMSE above 250 hPa
- Lower height bias below 10 hPa
- Height RMSEs are very close

### Scorecard against ECMWF Analysis

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Baseline vs. NoRO

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- Positive impact in ACC and RMSE over SH and Tropics
- Degradation in RMS of height in troposphere and wind and temperature at upper atmosphere

### Scorecard against ECMWF Analysis

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• Supplement vs. baseline

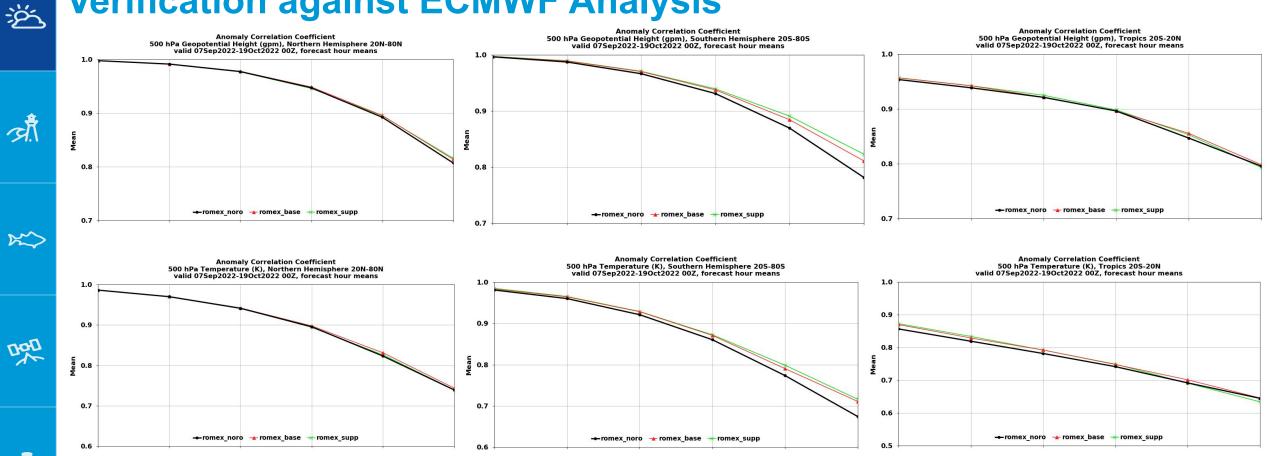
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- Overall positive impact in ACC and RMSE for short range over SH and RMSE in Tropics except for height
- Positive impact on wind and temperature RMSE at upper atmosphere over NH

### **Verification against ECMWF Analysis**



- Height ACC at 500 hPa: Improvement over SH
- Temperature ACC at 500 hPa: Improvement over NH, SH and Tropics
- Significant improvement in SH

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### **Verification against ECMWF Analysis**

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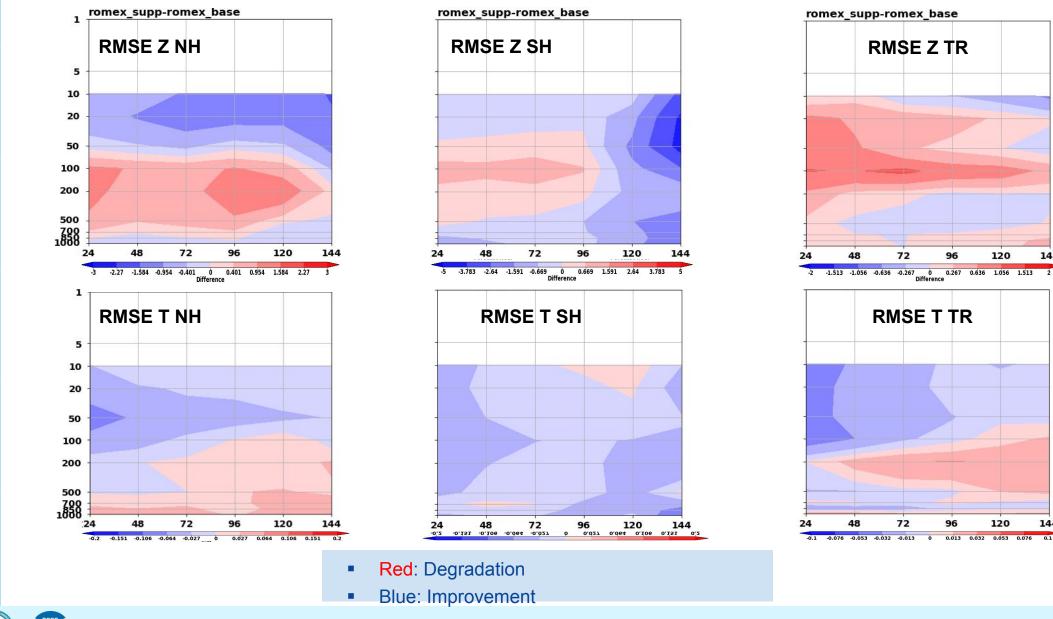
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Department of Commerce // National Oceanic and Atmospheric Administration // 12

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### **Summary**

- ROMEX data verification on GFSv17 for 1.5 months with atmosphere-only DA
- More positive signs than 3-week results: Improvement in |O-B|/B bias < 40 km and RMS < 20 km in the supplement experiment</li>
- Larger impact when more ROMEX data was assimilated
  - Against radiosonde data: ROMEX data resulted in a cold bias in the mid to low troposphere and a lower height bias below 10 hPa
  - Against ECMWF analysis: Positive impact on ACC and RMSE especially over SH and Tropics; Positive impact in NH as well with ROMEX supplement data
  - Further tests required for GFSv17
  - NOTE: Yunyao, Tianmu, and GNOS data are not utilized in current experiments



