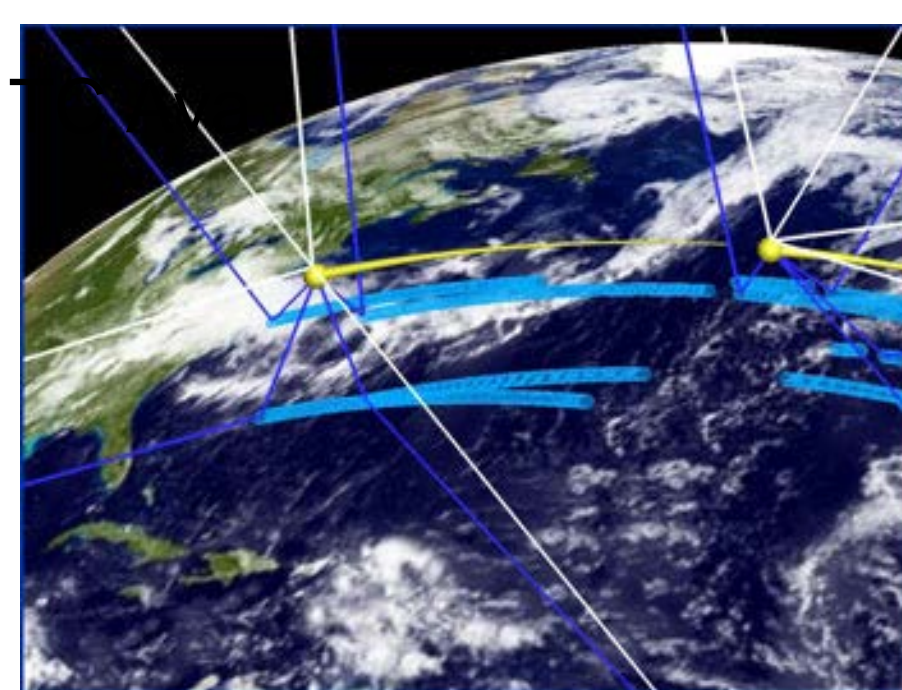




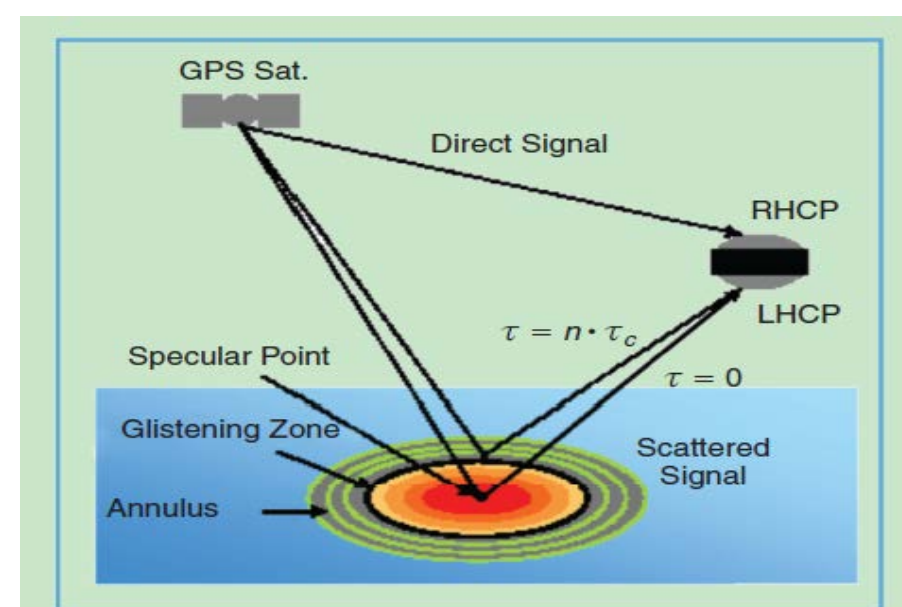
1. Introduction



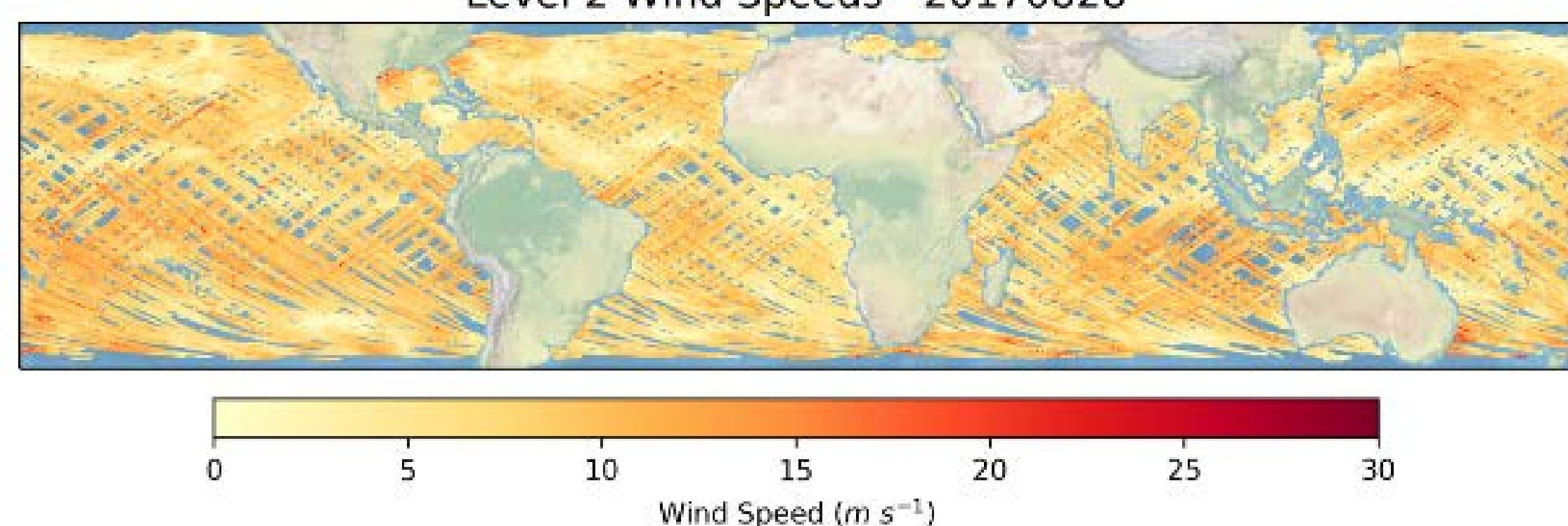
CYGNSS: The Cyclone Global Navigation Satellite System mission, launched in December 2016

Instruments: 8 micro-satellite observatories receive both direct and reflected signals from GPS satellites

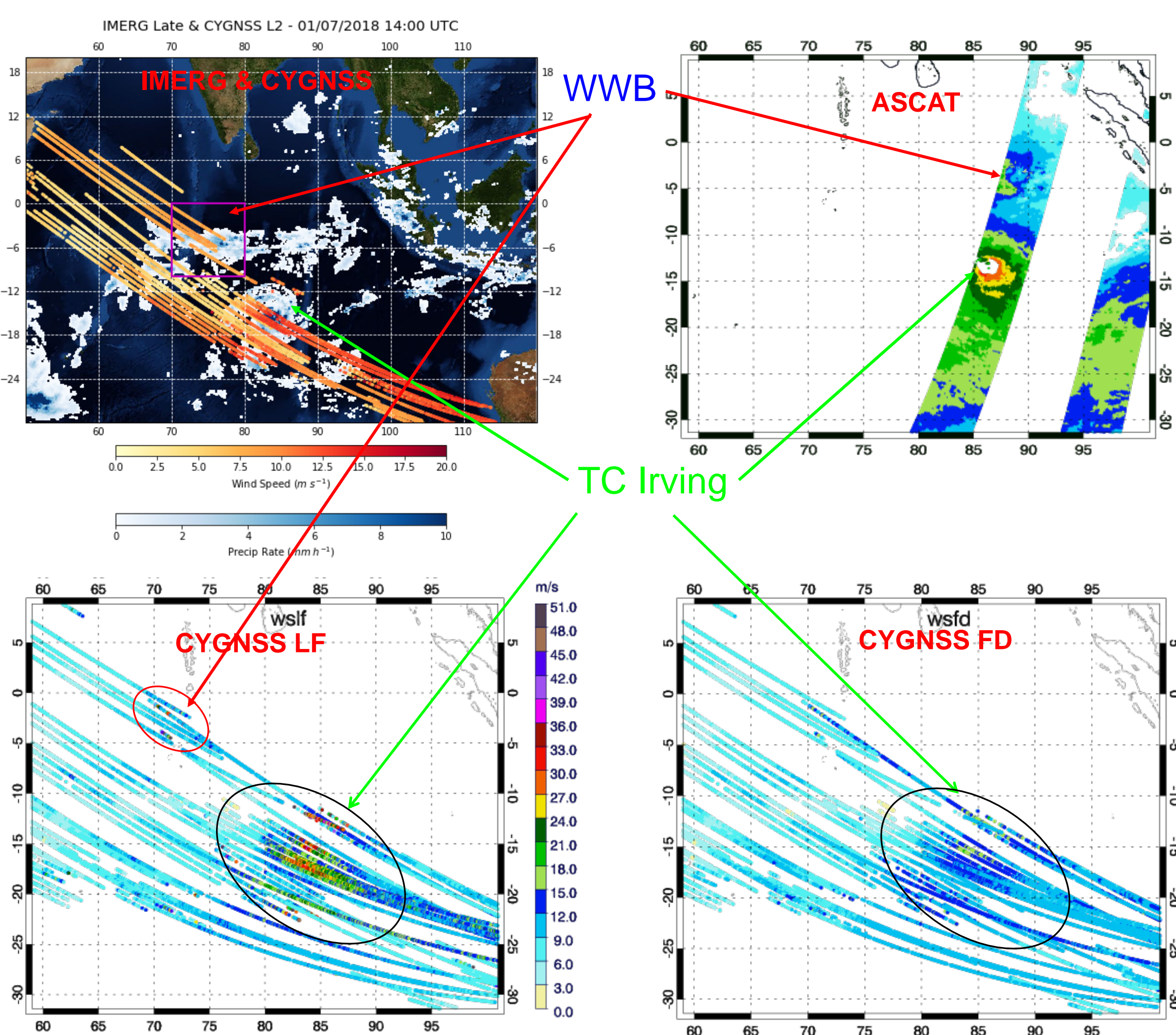
Observation: Retrieved ocean surface wind speed with rapid revisit times in regions of deep convection, in particular TCs and MJO events



Level 2 Wind Speeds - 20170828



3. Observational data 6 – 9 January 2018



2. Objectives and Methodology

Objectives:

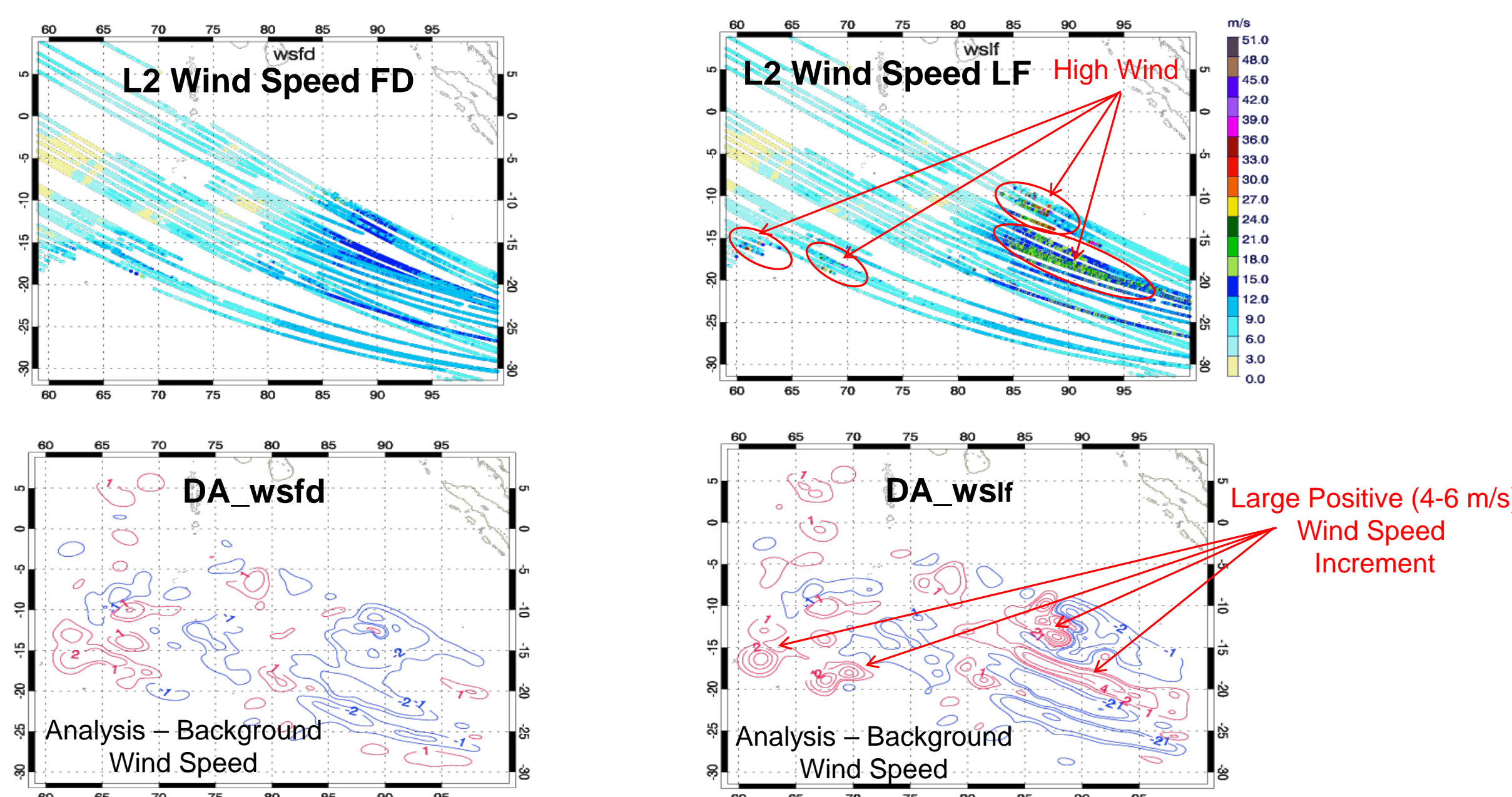
- To assimilate CYGNSS v2.1 Level 2 wind speed data (LF vs. FD; LF – "Limited Fetch" Geophysical Model Function (GMF) used for Young Seas; FD – fully developed seas)
- To assimilate combined satellite data (IMERG precipitation, ASCAT ocean surface wind vector, and CYGNSS wind speed)
- To assess the impact of CYGNSS data on forecasts of mesoscale convection, specifically on westerly wind bursts (WWBs) events and Tropical Cyclones (TCs).

Model configuration and data assimilation:

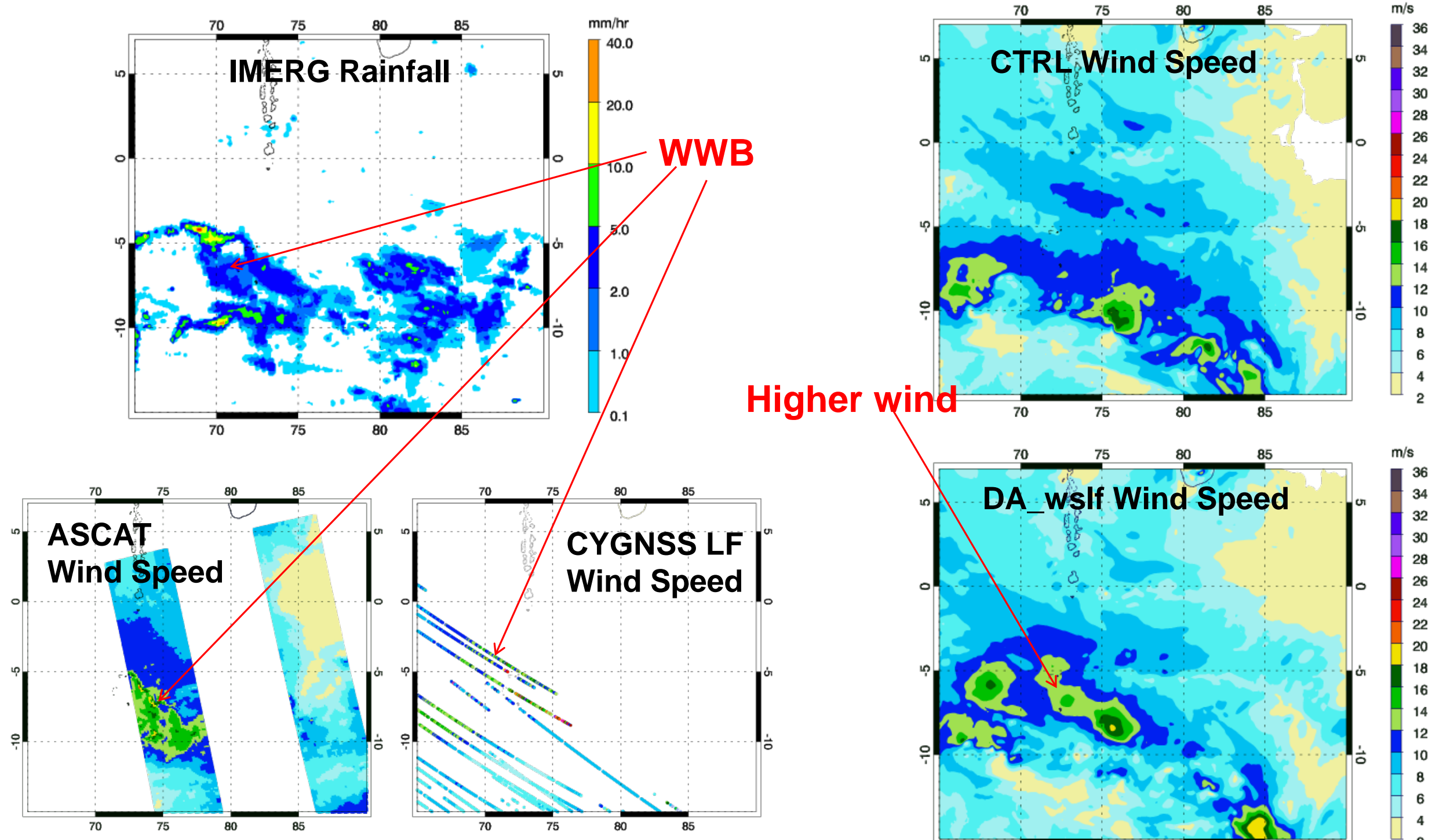
- WRF ARW v3.8, WRFDA hybrid Ensemble 4DnVar
- 9-km resolution, 00 UTC 6 – 9 January 2018
- Observations:
 - IMERG precipitation rate (mm/hr)
 - ASCAT wind speed and direction
 - CYGNSS v2.1 Level 2 wind speed data (errors: 2 m/s for wind speed < 20 m/s, 10% for wind speed > 20 m/s)

4. Result – Assimilation of CYGNSS Data Only

Impact on TC Irving at 15 UTC 01/06/2018

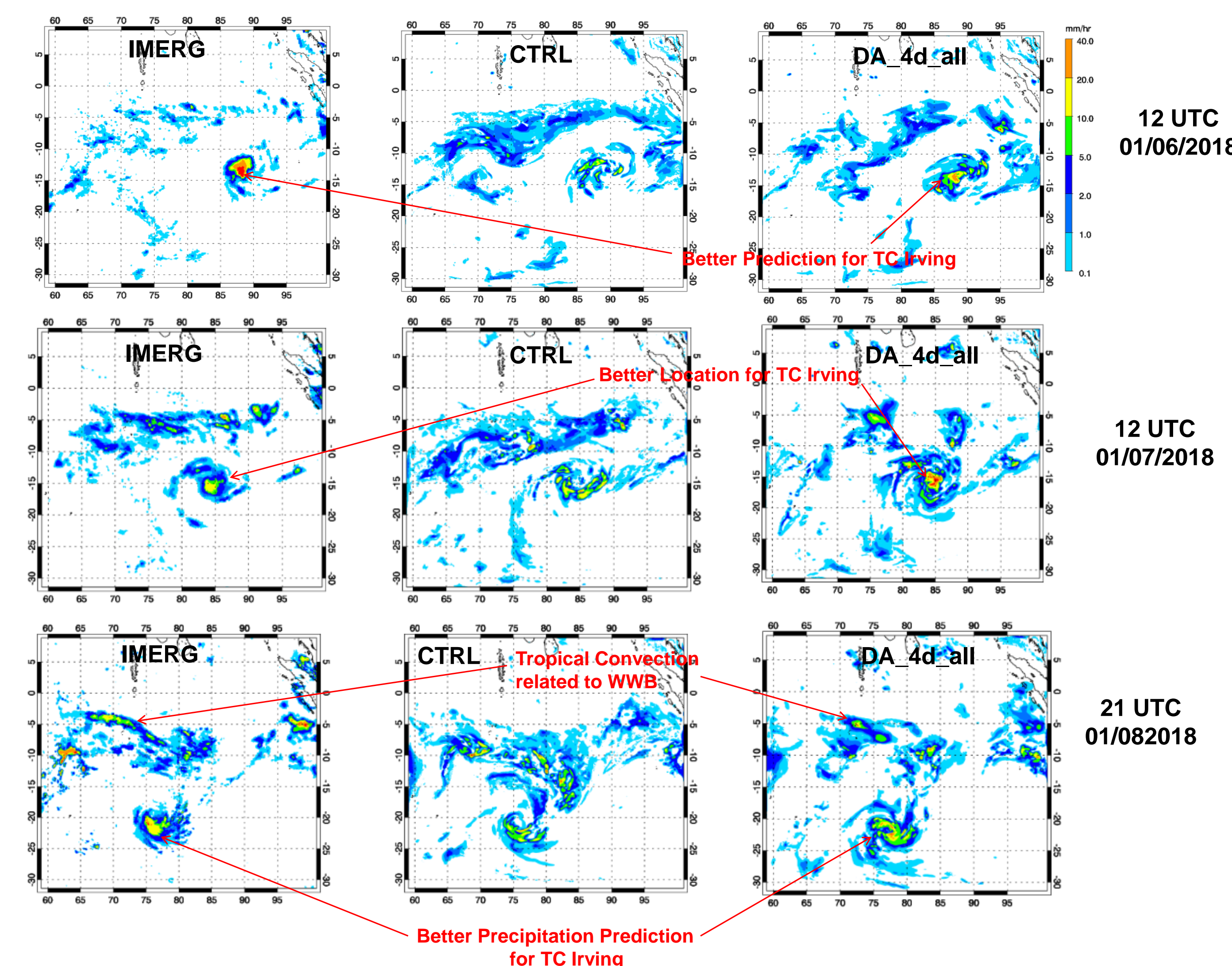


Impact on WWB at 15 UTC 01/08/2018

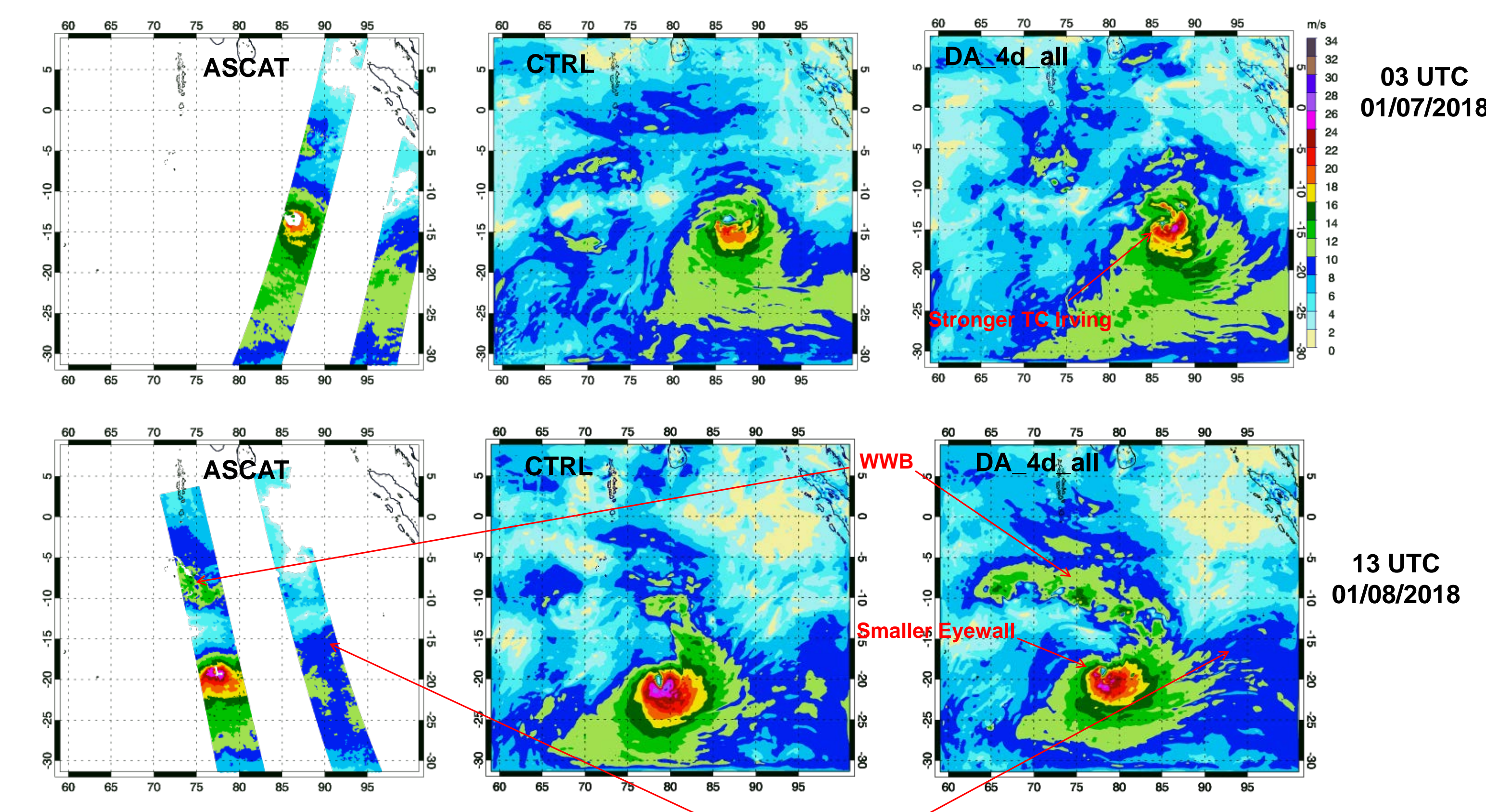


5. Result – Assimilation of Combined IMERG, ASCAT, and CYGNSS Datasets

Impact on Precipitation Field

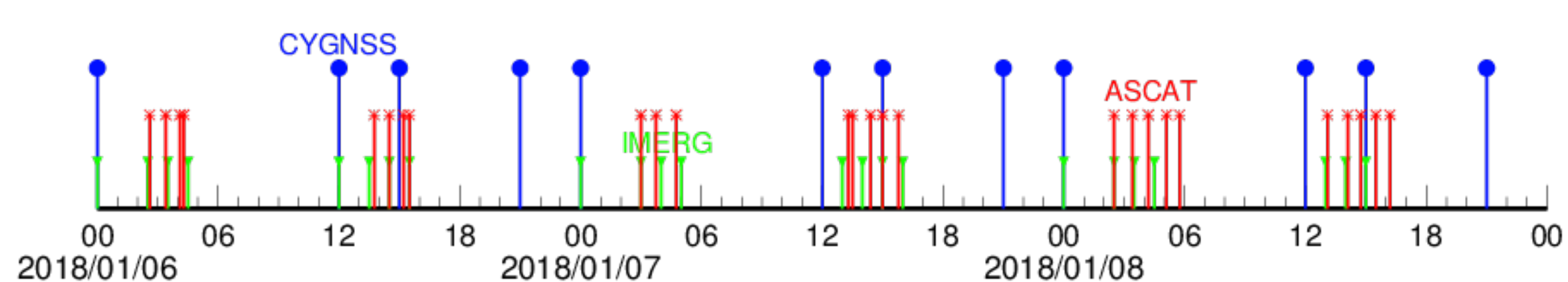


Impact on 10-m Surface Wind Field



Experiments	Data Assimilation
CTRL	No
DA_wsfd	CYGNSS FD wind speed at 00, 12, 15, 21 UTC 6 – 8 January 2018
DA_wslf	LF wind around Tropical Cyclone Irving plus FD wind elsewhere
DA_4d_all	CYGNSS wind speed, IMERG precipitation, and ASCAT wind vector data

DA_4d_all Data Assimilation Process



6. Discussion

- Positive impact was found on wind field when CYGNSS L2 LF wind speed data was assimilated for TC Irving and a westerly wind burst (WWB) event during 2018 January MJO onset.
- When the combined CYGNSS wind speed, IMERG precipitation, and ASCAT wind vector were assimilated, improvement was produced in precipitation and wind fields for both TC Irving and the WWB.
- Further examination on data impact in other fields and statistic significance is ongoing.

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