Validation of HWRF forecasts with satellite observations

Project team

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This NOAA Joint Hurricane Testbed project was funded by the US Weather Research Program in NOAA/OAR's Office of Weather and AirQuality

Background

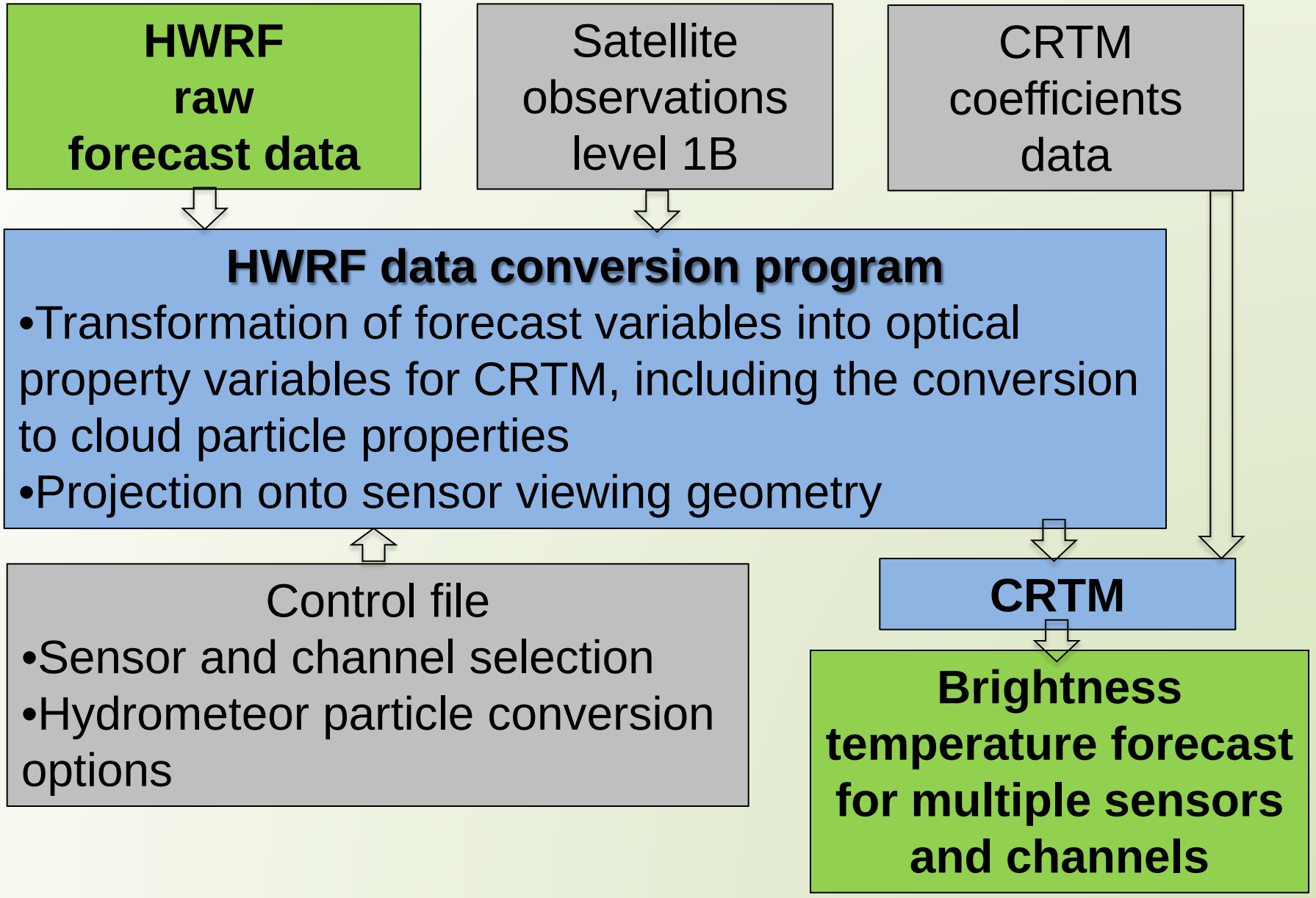
- **Goals**
  - Develop forecast post-processing module for simulating the satellite equivalent observations using HWRF forecasts
  - Implement the module in HWRF operational post-processing environment
  - Develop satellite-data-specific diagnostics for validation of HWRF forecasts
- Project time line
  - September 2011 – August 2013

Summary of accomplishments Year 1-first 1/2

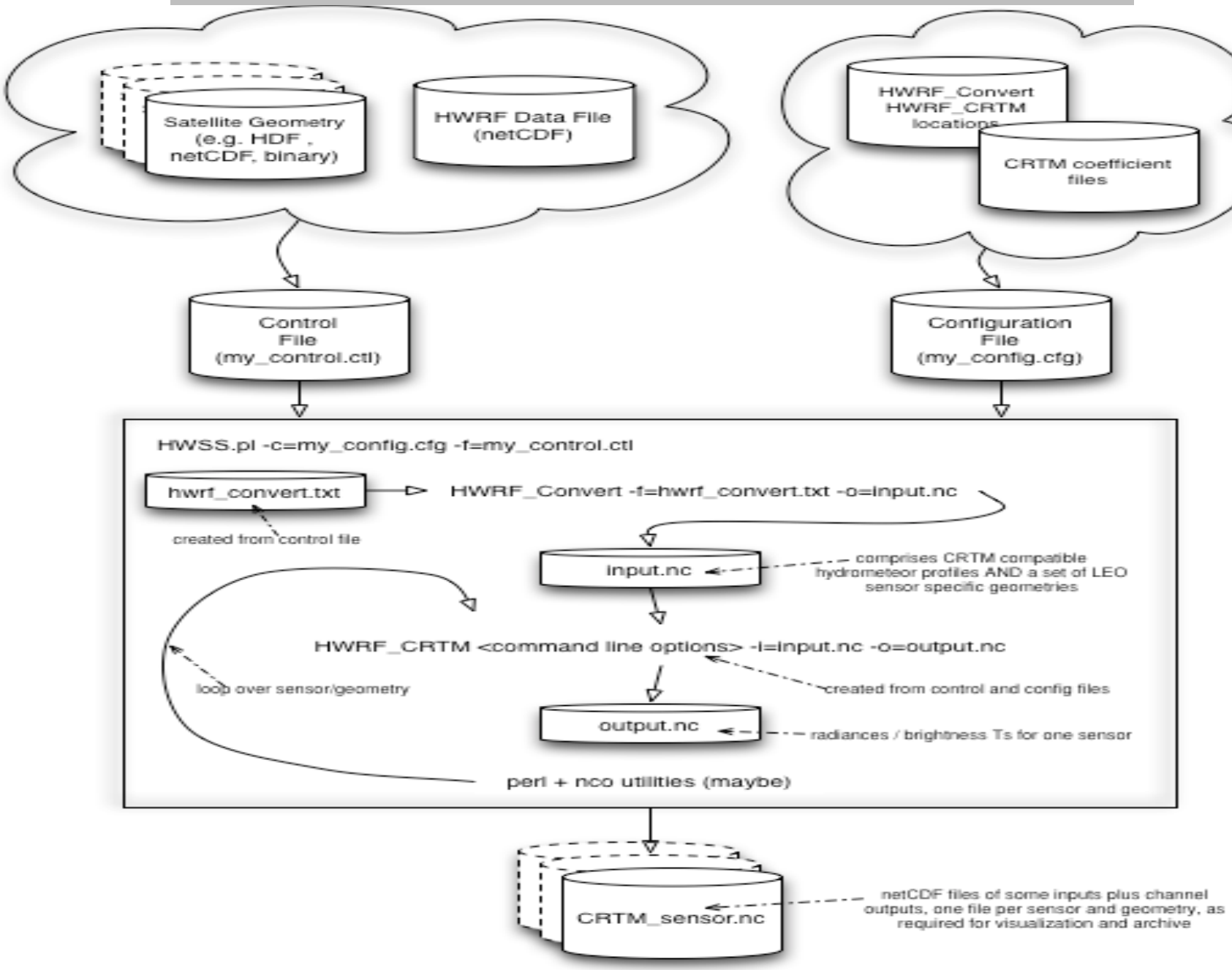
- The satellite simulator module, named Hurricane WRF Satellite Simulator (HWSS) has been completed using latest release of CRTM (Community Radiative Transfer Model, version 2.0.5)

- Initial testing of HWSS was performed using retrospective forecast for hurricane Earl in period 08/28 – 09/02, 2010
  - HWRF pre-operational 2012 model version was used with 3-grid configuration at resolution 27/9/3 km.

Hurricane WRF Satellite Simulator

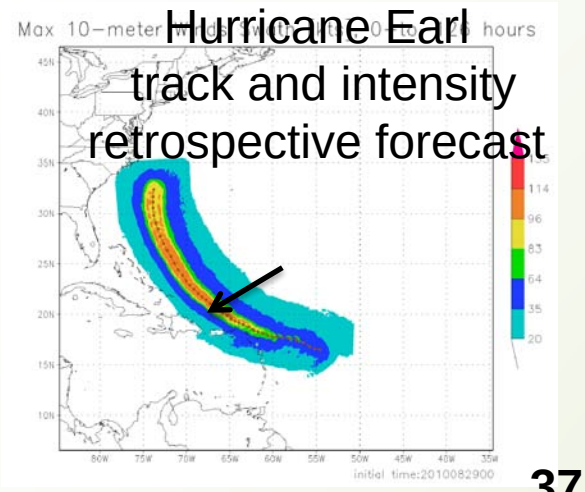


HWSS pearl script control and run chart



Currently supported platforms in HWSS

Platform	Sensor	Bands
GOES-13	Imager	Vis/IR
GOES-13	Sounder	Vis/IR
Aqua	AMSR-E	Microwave
DMSP F-20	SSMIS	Microwave
DMSP F-19	SSMIS	Microwave
DMSP F-18	SSMIS	Microwave
DMSP F-17	SSMIS	Microwave
DMSP F-16	SSMIS	Microwave
DMSP F-15	SSM/I	Microwave
TRMM	TMI	Microwave

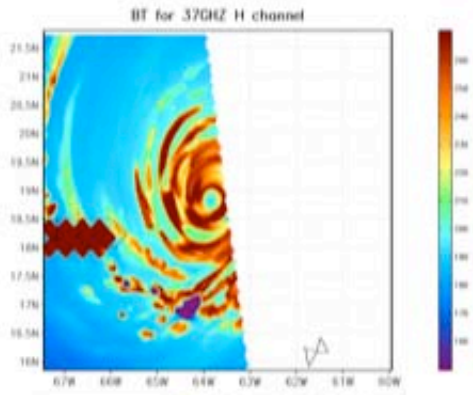
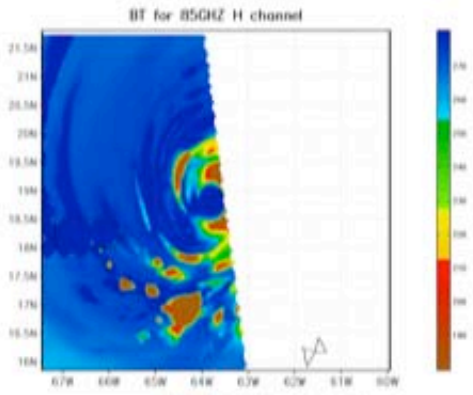
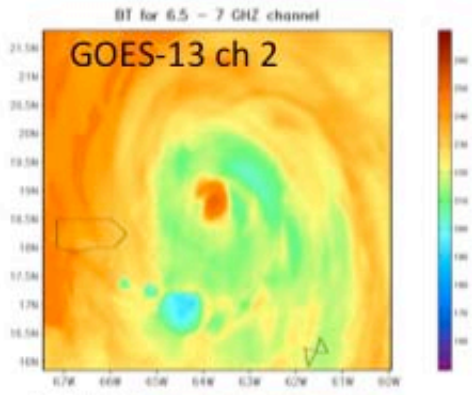
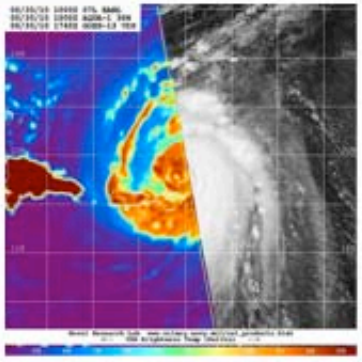
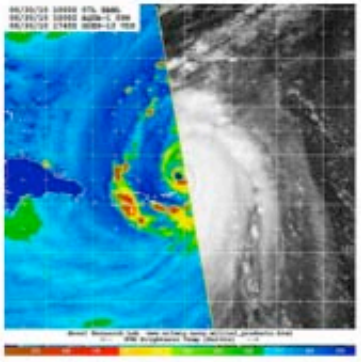
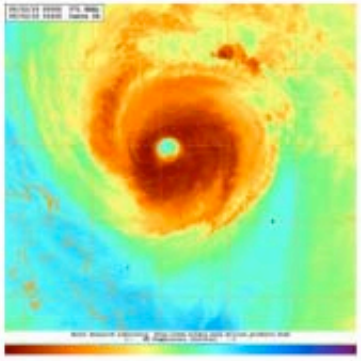


Hurricane Earl
track and intensity
retrospective forecast

Test results

Comparison to observation images

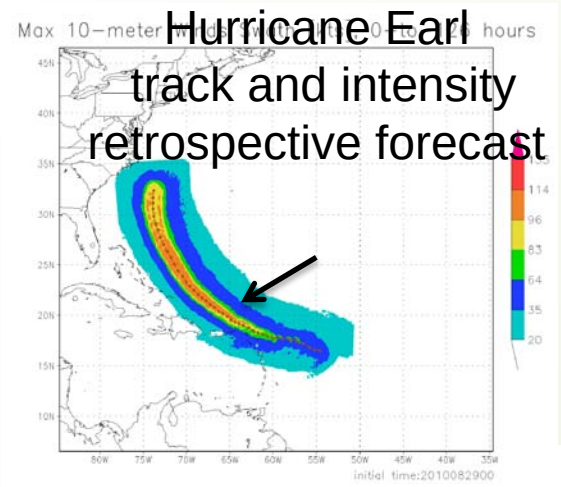
Hydrologic structure

	37h GHz AMSRE	85 GHz AMSRE	GOES-13 CH 2
forecast			
observations			

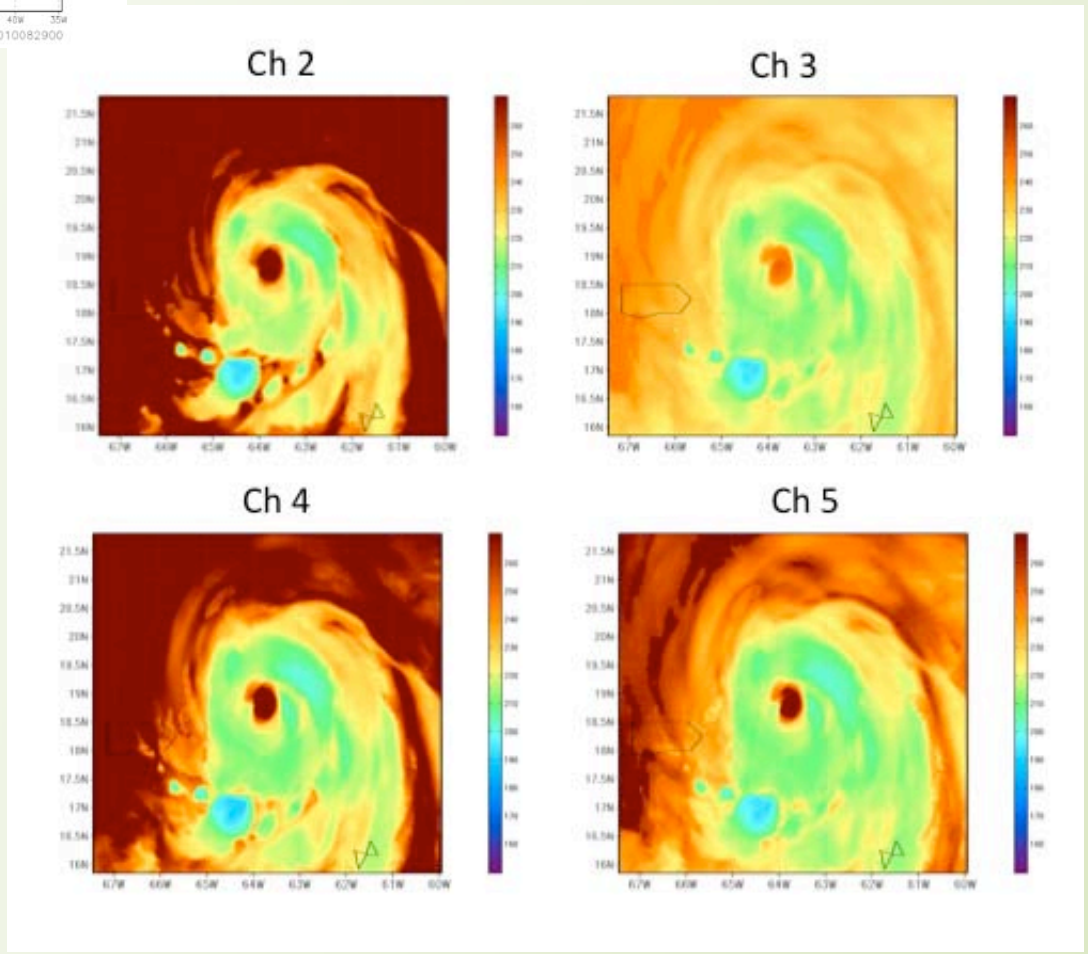
Test results

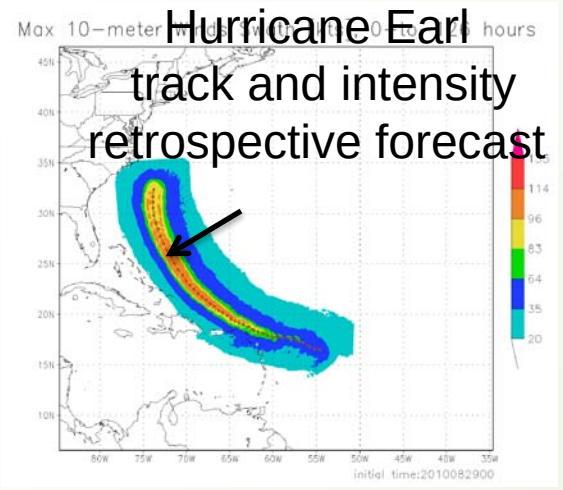
IR window channels

water vapor and cloud distribution



Hurricane Earl
track and intensity
retrospective forecast





Hurricane Earl
track and intensity
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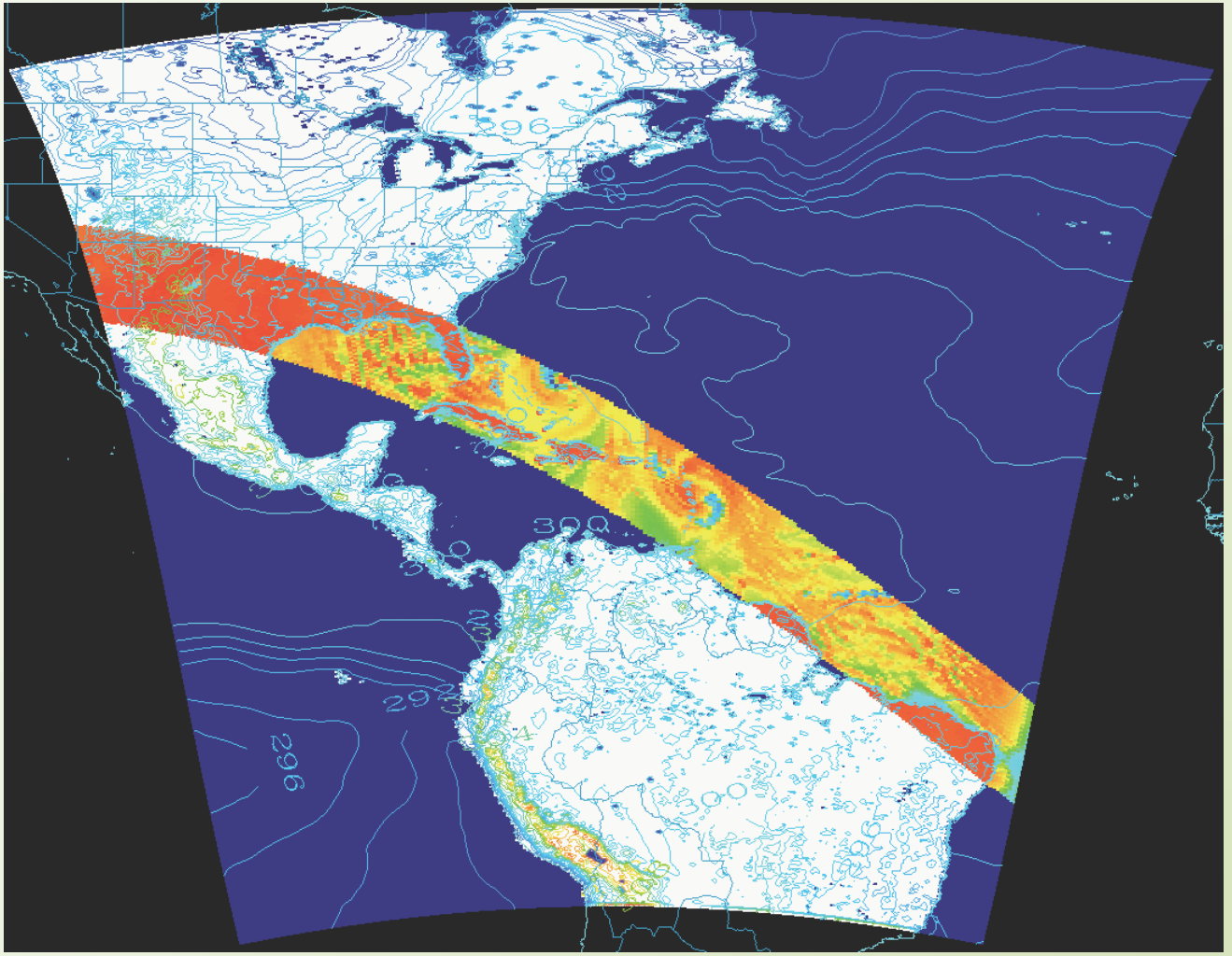
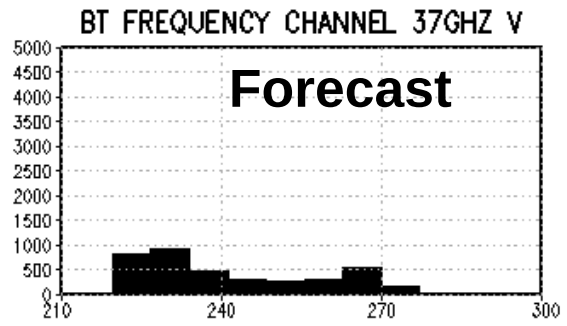
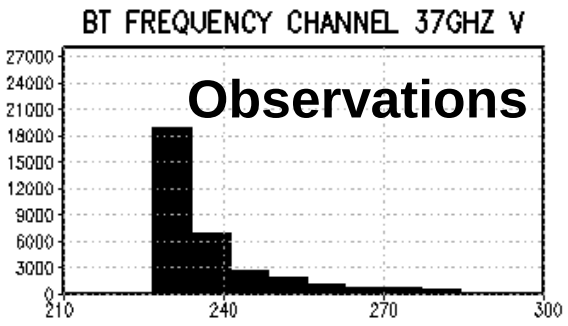
Test results

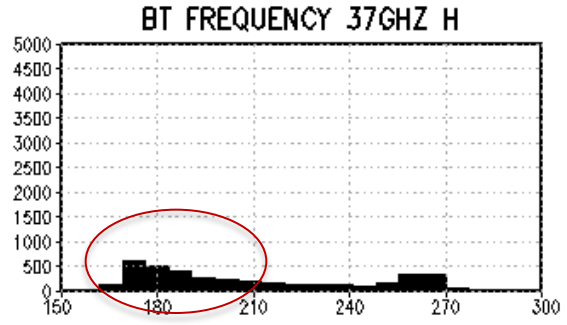
Large scale swath

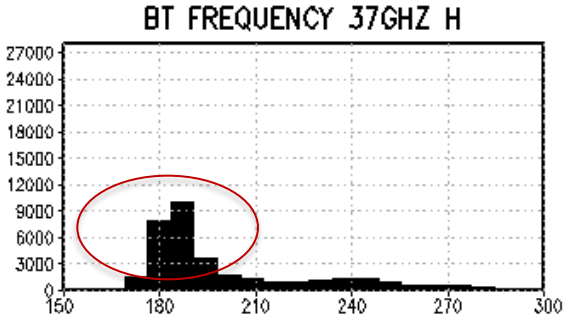
TMI 85 GHz

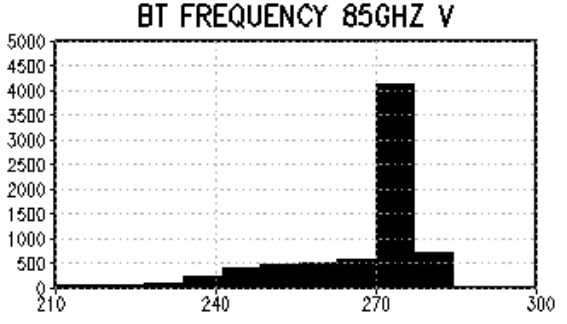


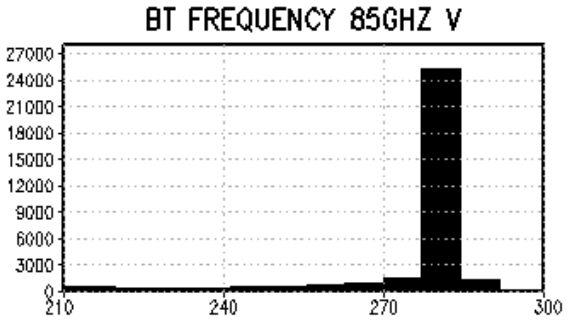


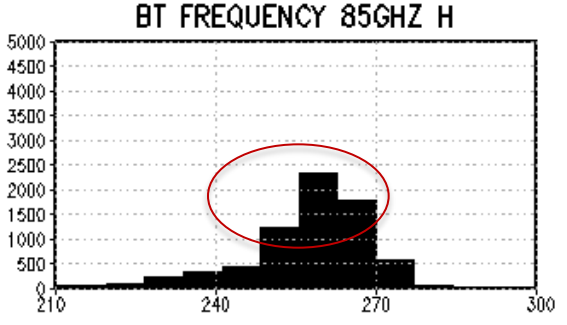


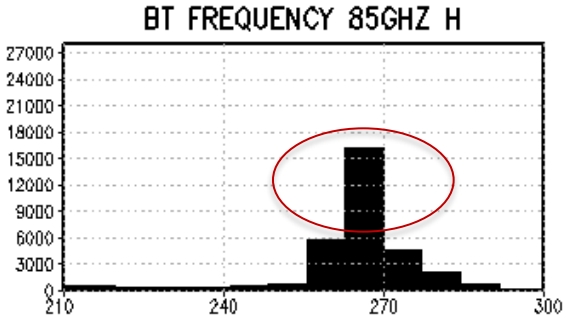












Test results

Bias diagnostic

Frequency diagrams

TMI
37 and 85 GHz

Next steps

- **Complete imaging capability for all channels or combination of them using standard color tables**
- **Complete imaging of observations using HWSS observation input data instead of NRL Tropical web portal**
- **Compute FDs and bias and variance diagnostics for 37 and 85 GHz and GOES water vapor for multiple cases**
  - Devising the satellite observation data streams into the post-processing is major challenge
- **Implement HWSS in HWRF operational post-processing (on or off-line)**
  - **Collaboration with EMC/HWRF and NHC**