



9th NOAA TBPG Workshop

Kansas City, MO

April 10-11, 2018

Roundup Presentation

Joint Center for Satellite Data Assimilation

Presented by Jim Yoe

Contributions from T. Auligne, B. Johnson, Y. Tremolet, H. Shao, F. Vanderberghe, G. Vernieres, and others



FY17 Highlights

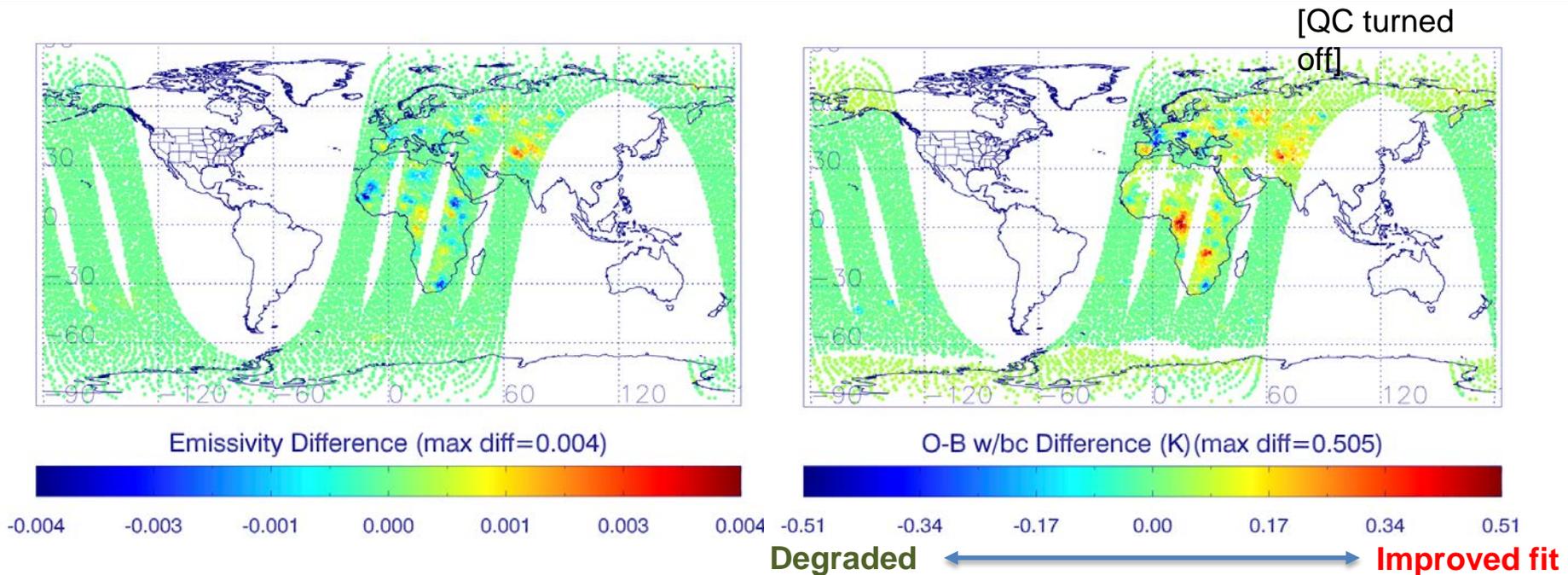
Joint Center for Satellite Data Assimilation

- **Community Radiative Transfer Modeling Project**
 - Version 2.3.0 Release 11-28-2017 – (AND migration to VLAB)
No fewer than 9 new features
 - Development of modules CHYM, CASM, CSEM
 - Code optimization & solver testing
- **New and Improved Observations (NIO) Project**
 - Assimilation of radiance data over all surfaces
 - Assimilation of AHI and ABI radiance observations
 - Evaluation of KOMPSAT5 GNSSRO bending angle profiles



NIO: Adding Emissivity Control Variable for All Surface Radiance Data Assimilation

Difference in emissivity and OmB of T_b at ATMS channel 3 (50.3 GHz) between GSI w/o and w control variable (CV)



Changes in emissivity lead to proportional changes to T_b for surface sensitive channels and improved T_b background (as well as analysis) fit to observations



FY17 Highlights

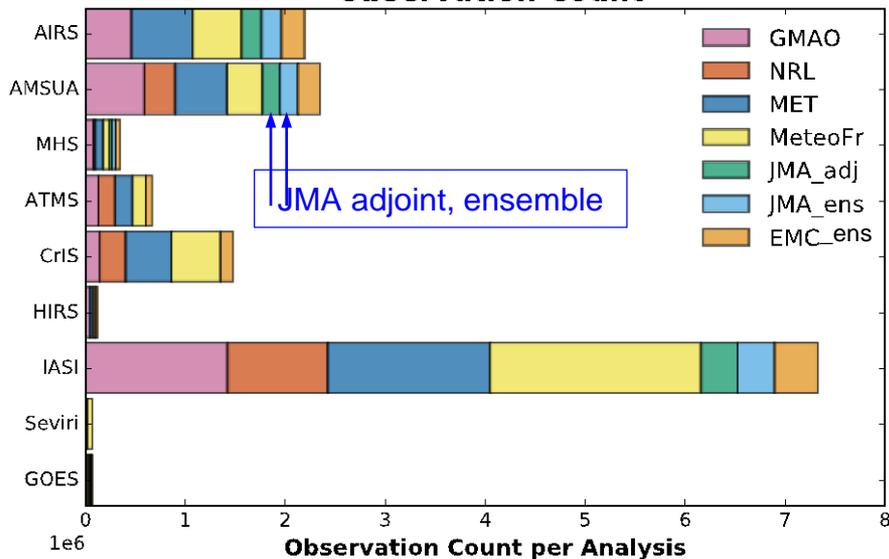
Joint Center for Satellite Data Assimilation

- **Impact of Observations (IOS) Project**
 - Evaluation of Commercial Weather Data Pilot data
 - Toward real-time FSOI capability
 - Standing capability to assess observations impact (OSE)

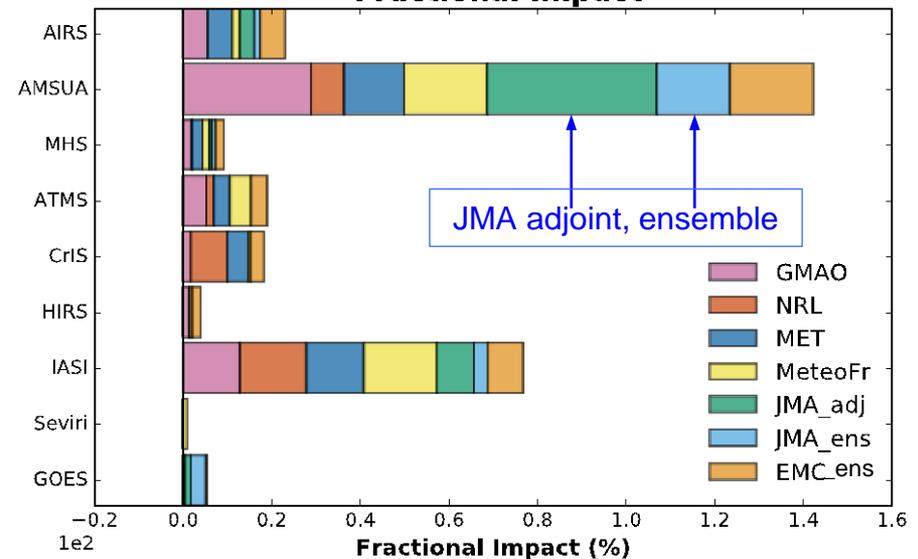


Forecast Sensitivity to Observation Impact (FSOI)

24-h Observation Impact Summary
Global Domain, 00Z 06Z 12Z 18Z DJF 2014-15
Observation Count



24-h Observation Impact Summary
Global Domain, 00Z 06Z 12Z 18Z DJF 2014-15
Fractional Impact



Impact of Satellite Radiances



FY17 Highlights

Joint Center for Satellite Data Assimilation

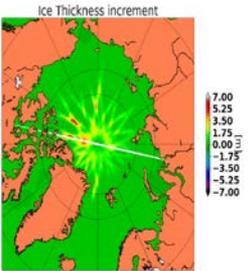
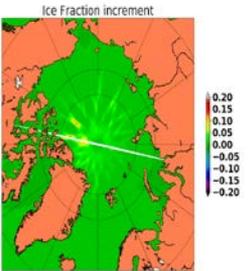
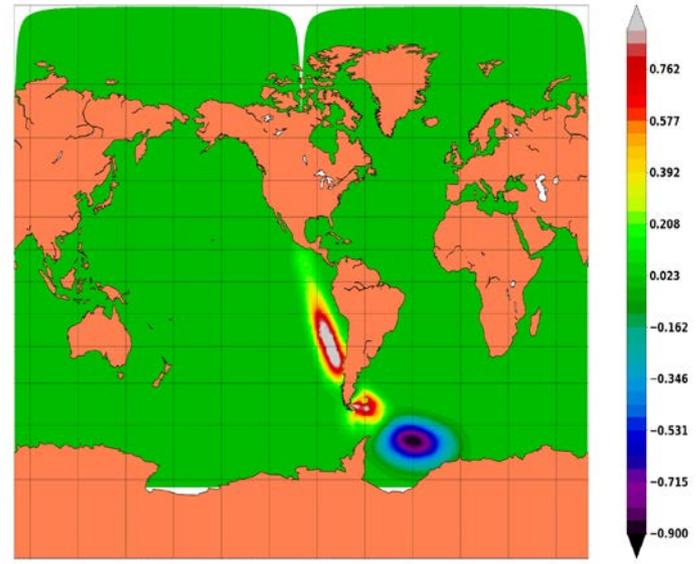
- **Sea-Ice and Ocean Assimilation (SOCA) Project**
 - Prototype JEDI model encapsulation of MOM5/SIS2
 - Unified Forward Operator (UFO)
 - Use of UFO/IODA from the MOM5/SIS2 JEDI encapsulation
 - Covariance modeling

Sea-ice Ocean Coupled Assimilation

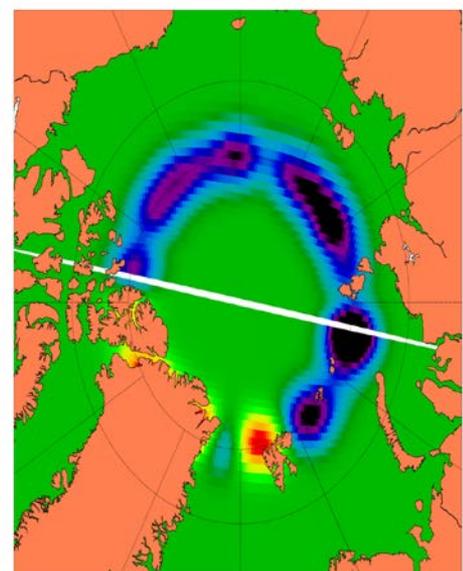
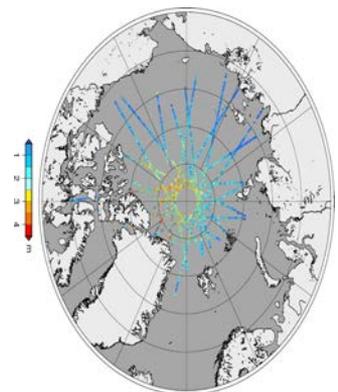
- **UFO:**
 - **Sea-ice fraction**
 - **Sea-ice thickness**
 - **Absolute dynamic topography**

- **MOM6-SIS2 interface:**
 - **Use of model's library for initialization**
 - **Prototype 3DVAR and EnVAR (no cycling)**

Example of Sea surface height increment from the assimilation of Jason-2, using a 20 member EnVAR from OOPS.



Example of Sea-ice fraction and thickness increment from the assimilation of CryoSat-2 retrieved ice thickness, using 3DVAR from OOPS.



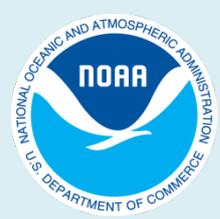
Example of Sea-ice fraction increment from the assimilation of synthetic sea-ice fraction, using 3DVAR from OOPS.



FY17 Highlights

Joint Center for Satellite Data Assimilation

- **Joint Environment for DA Integration (JEDI) Project**
 - Established tools for collaboration (wiki, github, zenhub)
 - Data Assimilation abstract layer prototyped (from OOPS)
 - Developed interfaces with FV3 (FV3GFS, GEOS-5,) MPAS, LFRic, WRF, MOM5
 - UFO prototype implementation for radiosonde T, radiances (AMSU-!), sea-ice fraction
 - Approach to governance and working practices (this is a new project)



FY17 Transition Metrics

Joint Center for Satellite Data Assimilation

| Major Tests Conducted | Transitioned to Operations (RL9) | Recommended for Transition to Operations (RL9) | Advanced To Experimental Testing (RL8) | Further Demonstration/ Development (RL 5-7) | Rejected For Further Testing |
|---|-------------------------------------|---|---|---|------------------------------|
| CRTM V 2.3.0 | X | | | | |
| Evaluation of Tb Impacts under all-sky conditions | | | | X | |
| Evaluation of Round 1 CWDP GNSSRO data | | | | X | |
| Prototype Unified Forward Operator | | | | X | |
| Prototype model encapsulations for JEDI | | | | X | |
| Evaluation of KOMPSAT5 GNSSRO data in GFS | | | X | | |
| Assimilation of AHI radiances | | | X | | |



FY18 Highlights: Update and Plans

Joint Center for Satellite Data Assimilation

- **CRTM Project**

- Task CRTM1: CRTM management, implementation, and support

- Task CRTM2: Computational and technical development

- Task CRTM3: Improved physical representation for aerosols, clouds, precipitation, and the Earth's surface

- **NIO Project**

- Task NIO1: Prepare for the assimilation of new instruments and observations

- Task NIO2: Assimilation of radiance data for all-surface and all-sky conditions

- Task NIO3: Geostationary hyperspectral infrared sounder radiance assimilation

- Joint Task NIO4/IOS4: Evaluate and advance GNSSRO data assimilation and support transition(s) to operations

- Task NIO5: Assimilation of land surface products into the GLDAS

- Task NIO6: Assimilation of aerosols and ozone products



FY18 Highlights: Update and Plans

Joint Center for Satellite Data Assimilation

- **SOCA Project**

- Task SOCA1: Implementation of unified ocean data assimilation

- Task SOCA2: Sea-ice data assimilation

- Task SOCA3: Wave data assimilation

- Task SOCA4: Ocean/sea-ice/atmosphere coupled data assimilation

- **IOS Project**

- Task IOS1: Toward real-time FSOI capability and inter-comparison

- Task IOS2: Improved assessment of observation impact

- Task IOS3: Impact-based adaptive observation processing



FY18 Highlights: Update and Plans

Joint Center for Satellite Data Assimilation

- **JEDI Project**

Task JEDI1: Infrastructure and support

Task JEDI2: Abstract code layer

Task JEDI3: Model space encapsulations

Task JEDI4: Observation space encapsulations

Task JEDI5: Interface for observation data access

- **Director's Office Project**

Task DOF1: JCSDA management and coordination

Task DOF2: Communications activities and audience engagement

Task DOF3: JCSDA External Research and Visiting Scientist Programs

Task DOF4: Technical support for O2R and R2O



Questions?

Joint Center for Satellite Data Assimilation

- **And for Additional Information**
 - **Contacts:**
 - James.g.yoe@noaa.gov
 - Thomas.auligne@noaa.gov
 - www.jcsda.noaa.gov