ATMOSPHERE TEAMS (IMAGERY, CLOUDS, AEROSOLS, OZONE, AND SOUNDINGS) OVERVIEW

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Atmosphere Lead
14 August 2017

Atmosphere Teams

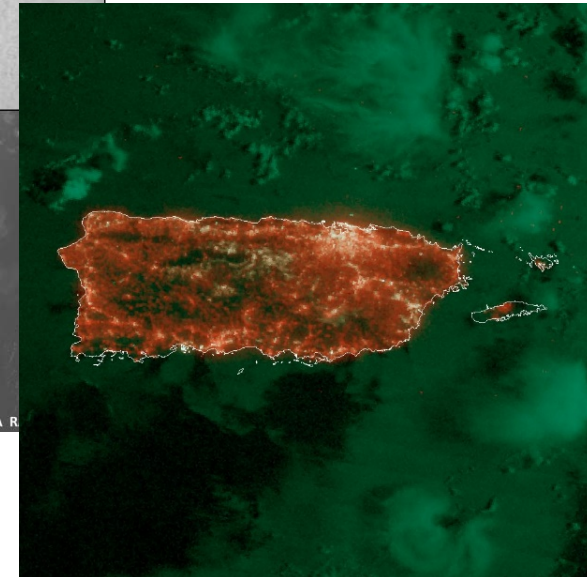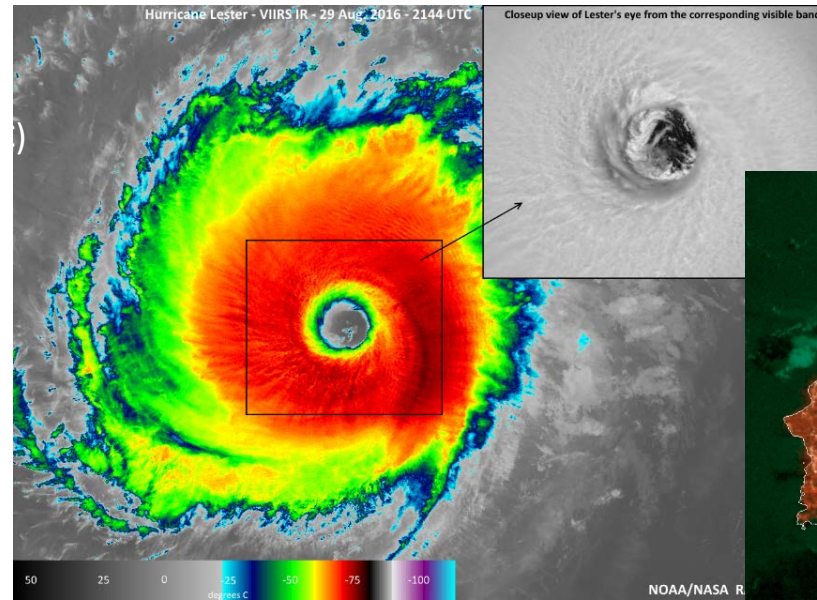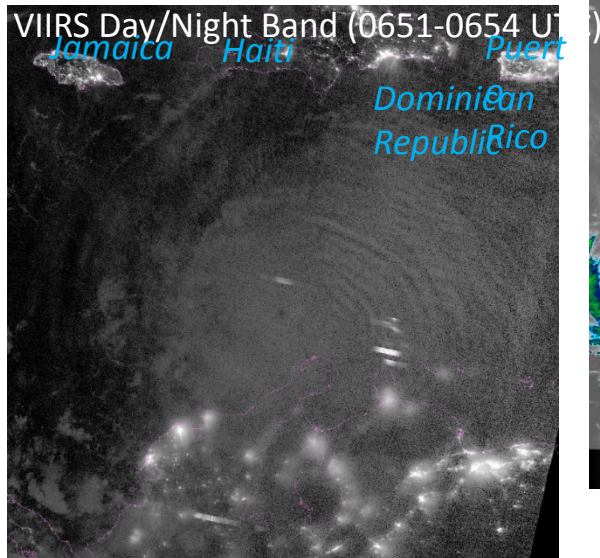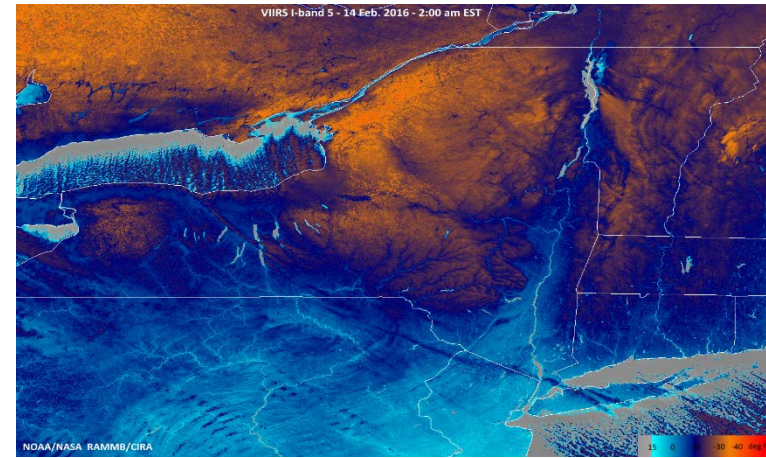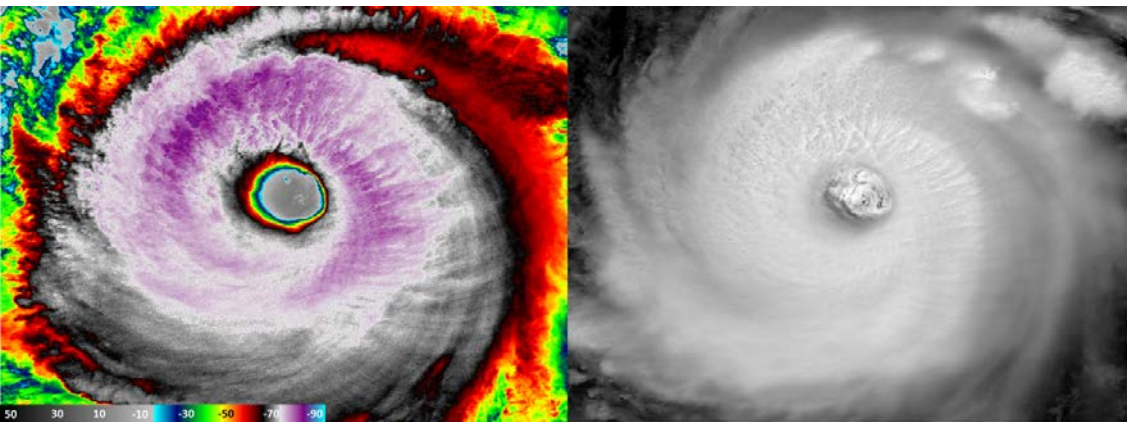| Team	StAR Lead	Other Leads or Team Contributors
Imagery	Don Hillger	Tom Kopp (Aerospace), and the Team
Clouds	Andy Heidinger	Tom Kopp (Aerospace), and the Team
Aerosols	Shobha Kondragunta Istvan Laszlo	Hongqing Liu, Hai Zhang, Pubu Ciren
Ozone	Larry Flynn	Eric Beach, Miyagawa Koji, Zhihua Zhang, Irina Petropavlovskikh, Wei Yu, Jianguo Niu

Soundings
   - NUCAPS
   - MIRS
	Lihang Zhou Mark Liu (now also ATMS SDR lead!)	Antonia Gambacorta, Flavio Iturbide Sanchez,Nick Nalli, kexin Zhang, Changyi Tan, Changyi Tan, Mike Wilson Chris Grassotti (CICS), Shuyan Liu, Junye Chen, Kevin Garrett, Bomin Sun

Help putting together the Atmosphere contributions	Lihang Zhou	Nai-Yu Wang (CICS)

VIIRS EDR IMAGERY
OVERVIEW

Don Hillger
and the Team

FY17 Accomplishments and FY18 Plans

- **VIIRS Imagery is Excellent:**
  - **Visible/IR are especially high quality** (and best spatial resolution among operational satellites, at 375 m)
  - **DNB/NCC is the innovative product** from VIIRS that is not available from any geostationary satellite/orbit (or will be for many years!)
  - **Interactions with users vital for Validation** (particularly Alaska and other NWS users)
  - **Social Media outlets** highly receptive of VIIRS Imagery. Good publicity for NOAA/NESDIS and JPSS/VIIRS

- **Path Forward with JPSS-1**
  - **NCC Terrain-Corrected Geo-locations needed** (shifts of several kilometers at higher elevations with ellipsoid geo-locations)
  - **New DNB aggregation modes** for end of swath pixels, resulting in extended swath and offset of nadir
  - **Imagery from 2 satellites with 50 minute separation**, to be able to do temporal analysis of imagery features (clouds, fires, smoke, ash, etc.)

Imagery Examples

VIIRS Day/Night Band (0651-0654 UTC)

Jamaica   Haiti   Puert

Dominican   Rico

Republic

Hurricane Lester - VIIRS IR - 29 Aug. 2016 - 2144 UTC

Closeup view of Lester's eye from the corresponding visible band

From EDR Imagery (KPP)

- NCC Imagery is dependent on the **stray light and other DNB fixes from the VIIRS SDR Team**.

- The **NCC LUT that may require adjustment**, but it is a **long-term need** and it would **NOT** require an update in the first 90 days

- Need to **visualize Imagery as soon as possible**, given we have to reach validation by L+90 days
  - Imagery to users
  - Feedback from users
  - Particularly NWS/AWIPS and Alaska

- **Extended granule for DNB** due to increased aggregation of J-1 data at end of swath.
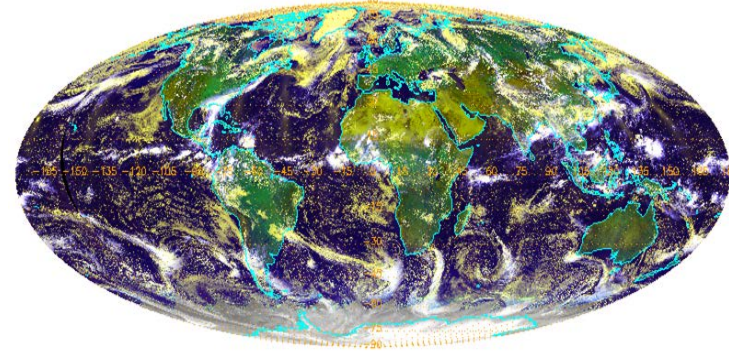
CLOUDS
OVERVIEW

**Andy Heidinger
and the Team**

Enterprise Cloud Mask (ECM) Status

- The ECM will replace the VCM for JPSS-1 EDR products

– The ECM is running operationally today on NDE

- Became operational, that is available on PDA, 5 July 2017

- The ECM team continues to address concerns from users

– Thin cirrus, shadow, dust and other bits added as requested.

- The ECM Cal/Val plan will be adjusted to account for user needs in the first few months of validation

– Beta will be accelerated from 8 to 5 months

- ECM Team would like to discuss with users their needs and concerns this week

– *Please attend the one hour cloud mask session on Tuesday for an informal discussion on what you need/would like to see us address in the first few months of validation*

- Communication is vital for success by all parties!

SNPP VIIRS Global False Color

SNPP VIIRS Global Cloud Fraction
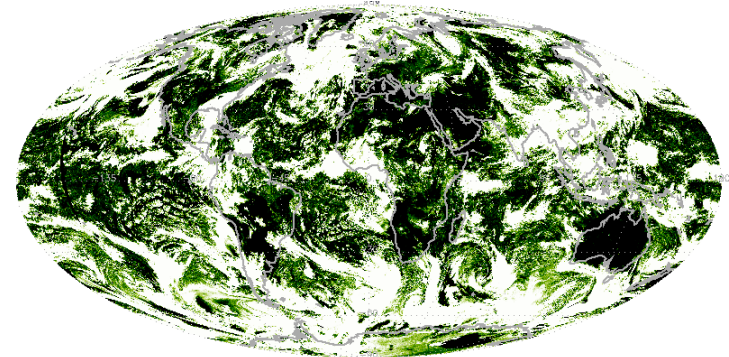
Enterprise Cloud Algorithms Operational Status

11 micron BT

NDE Cloud-top Pressure

- The NOAA Enterprise Cloud Products (Mask, Phase, Height, Day/Night Optical) became operational on July 5, 2017.

- Data should be available to public via CLASS on August 23.

- Operational version (v1r1) was that from June 2016.

- Updates delivered January 2017 and August 2017 are not yet running in NDE.

images show about 8 hours of NDE Enterprise Output. Top image is the 11 micron BT and the bottom image is the NDE operational cloud-top pressure product.
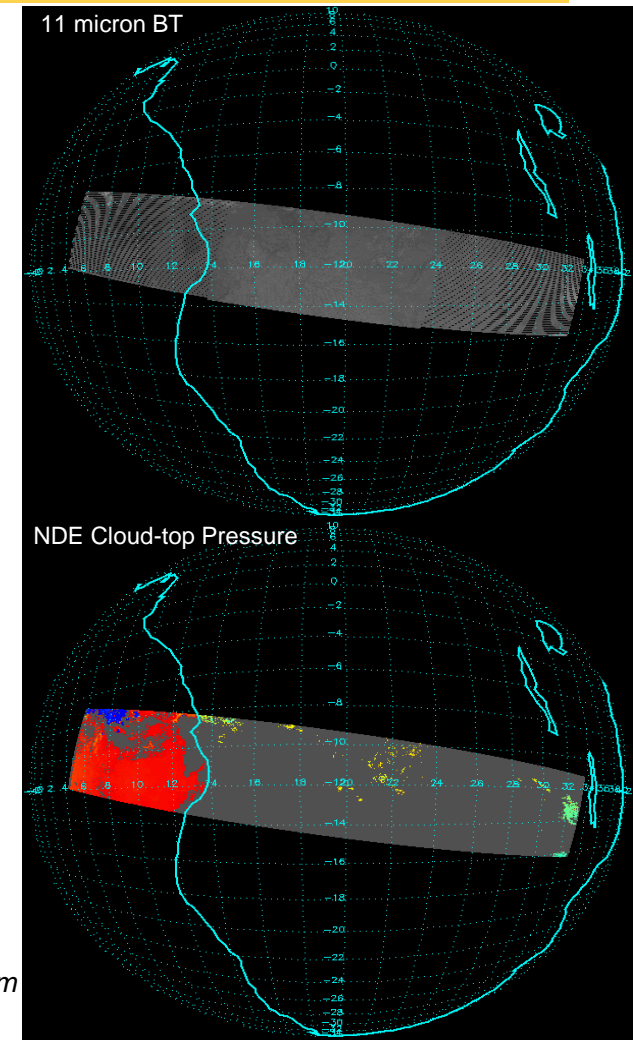
AEROSOL
OVERVIEW

Shobha Kondragunta

Istvan Laszlo

and the Team

Aerosol Highlights: Aerosol Optical Depth (AOD)
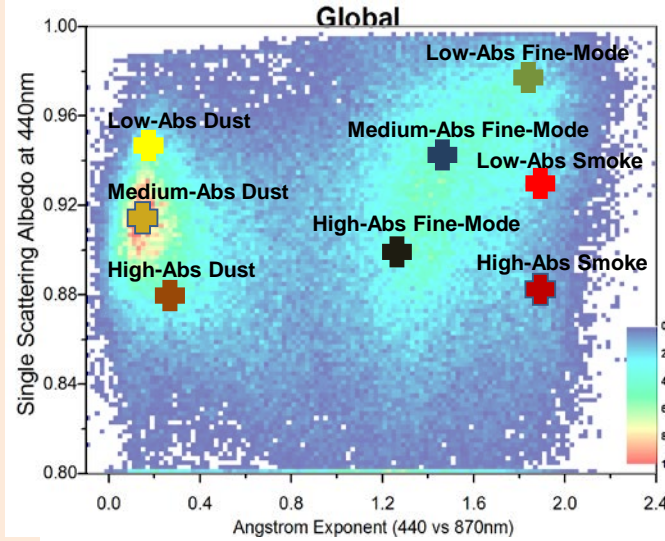
- ## *Science:*
  - Examined value in revising aerosol models.

- ## *Algorithm:*
  - Revised/updated detection of pixels affected by snow, snow-melt and smog.
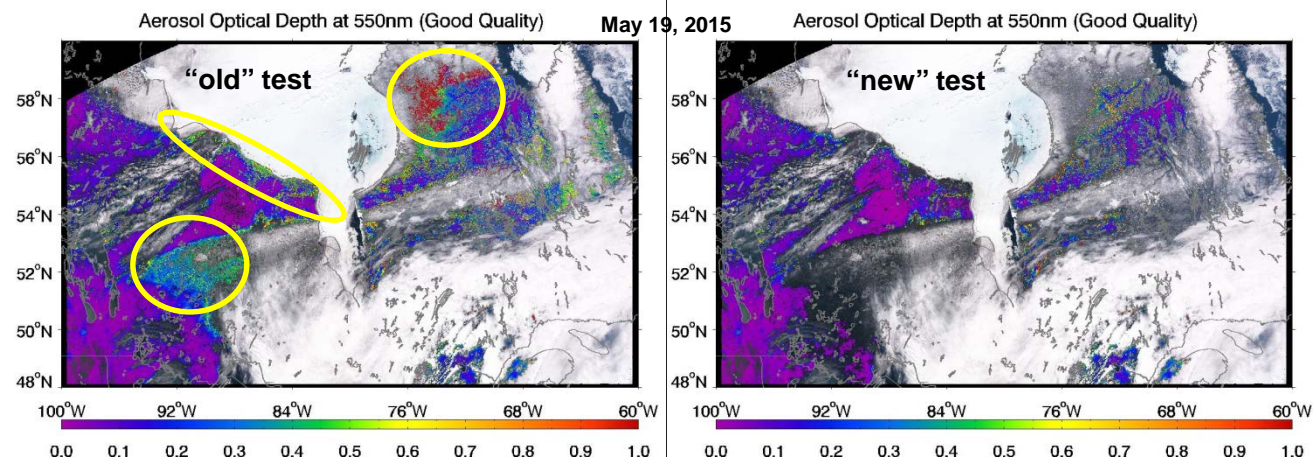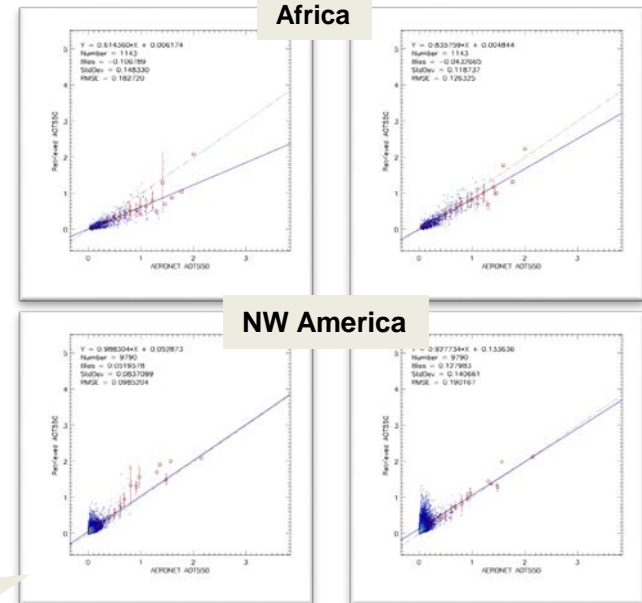
- ## *Other:*
  - Evaluated impact of reprocessed VIIRS SDR on AOD.
  - Verified correct implementation of EPS AOD algorithm in NDE.

Improvements where average AOD is high (Africa), but degradation over low AOD (NW America). Need more work!
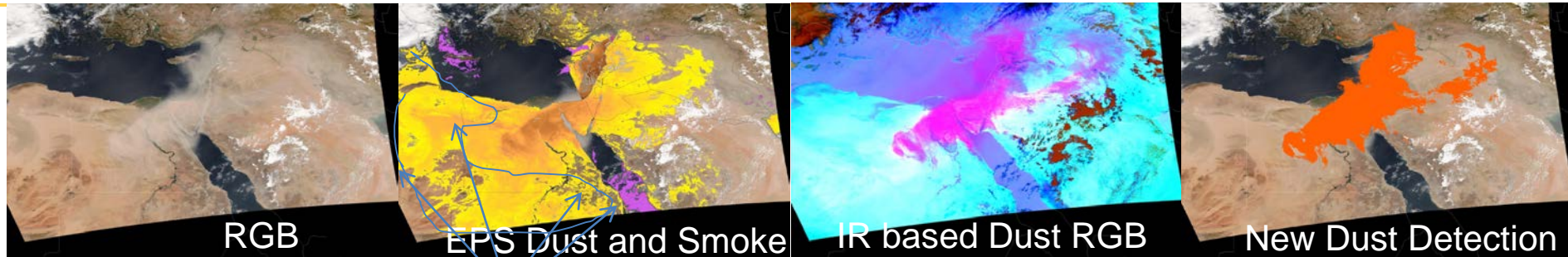

Updated tests improve avoiding retrieval over snow-contaminated pixels

Aerosol Highlights: Aerosol Detection Product (ADP_

RGB   EPS Dust and Smoke   IR based Dust RGB   New Dust Detection

False dust away from the plume in EPS

STAR aerosol team has been running EPS aerosol detection algorithm globally in near real time since January 21, 2016. EPS algorithm became operational in July 2017
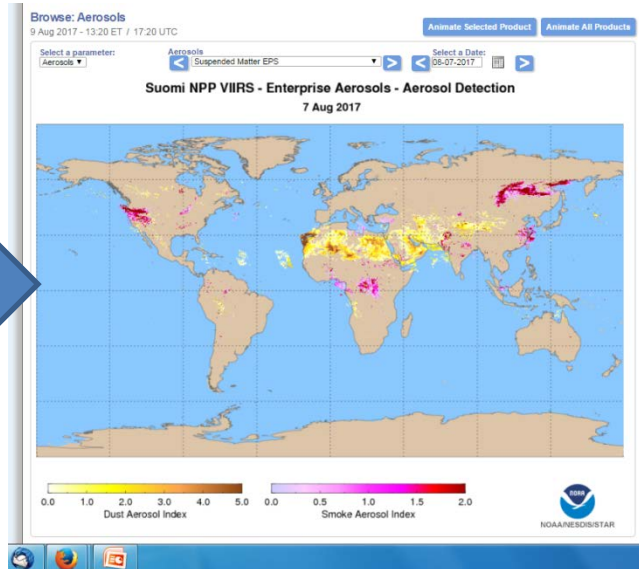
Current EPS dust detection product has false detections over bright surfaces and no detection in backward viewing geometry. Aerosol team conducted research to improve dust detection and minimize false detections to improve the algorithm. These improvements that utilize dust RGB (IR spectral differing tests) will be implemented in the next revisions to the EPS algorithm.
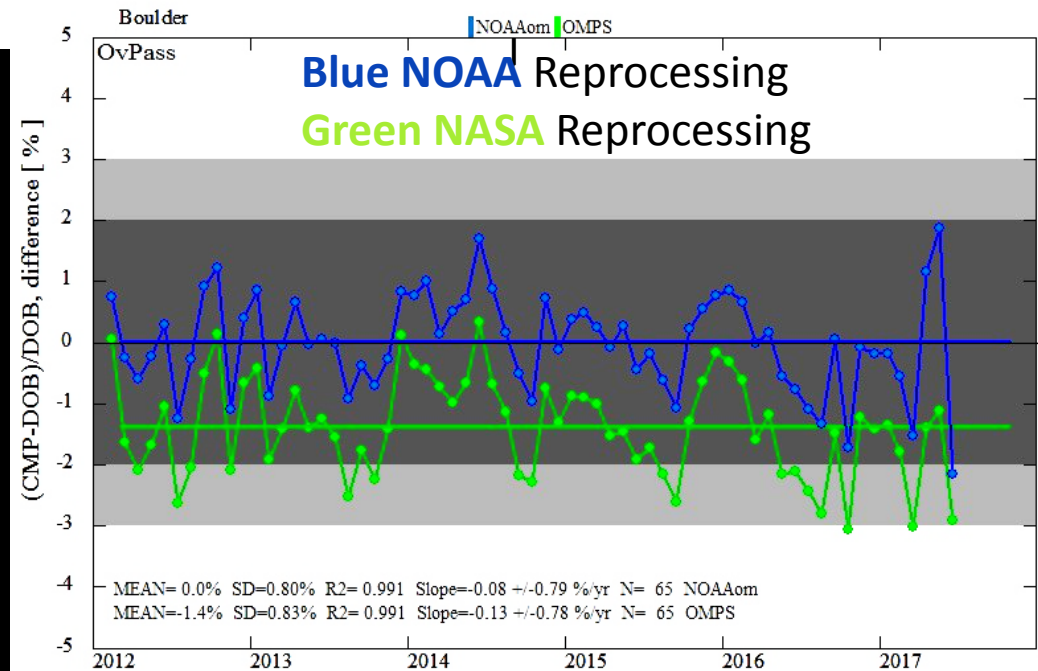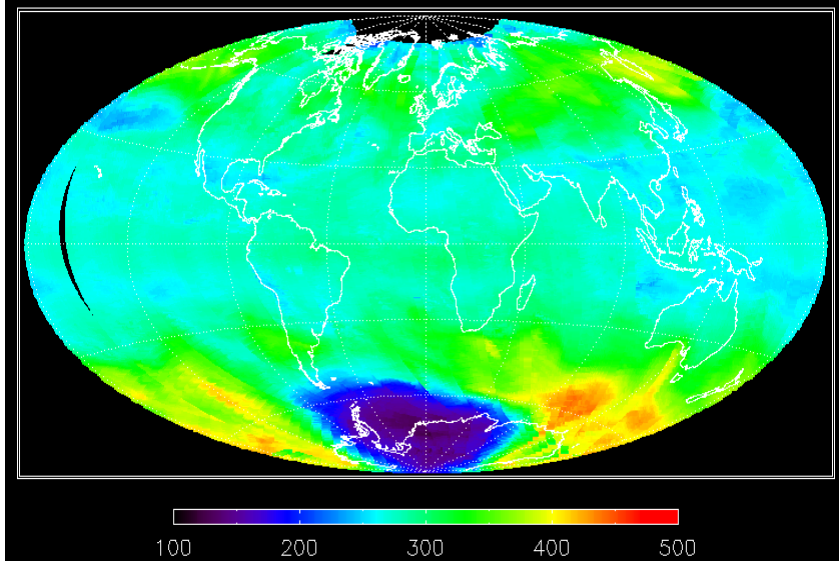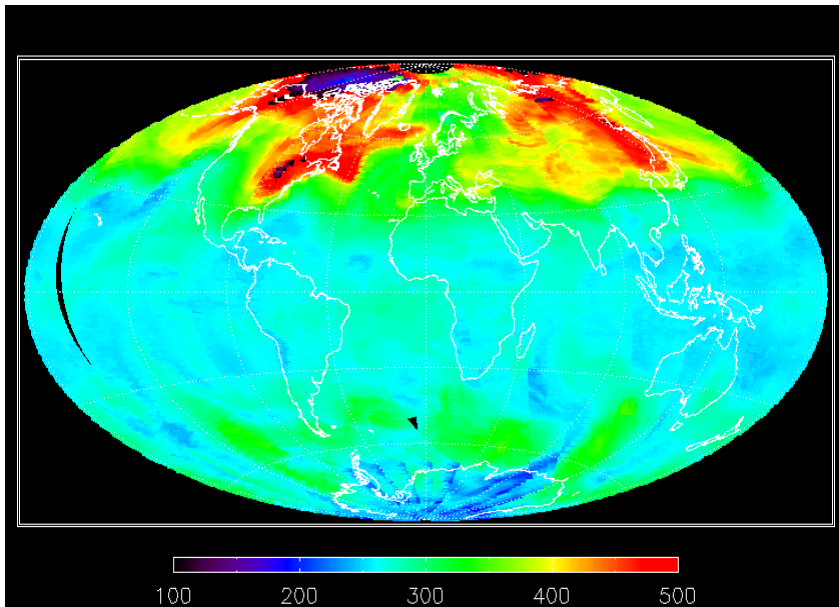
OZONE
OVERVIEW

Larry Flynn
and the Team

Total Ozone Daily Maps and Reprocessing Validation
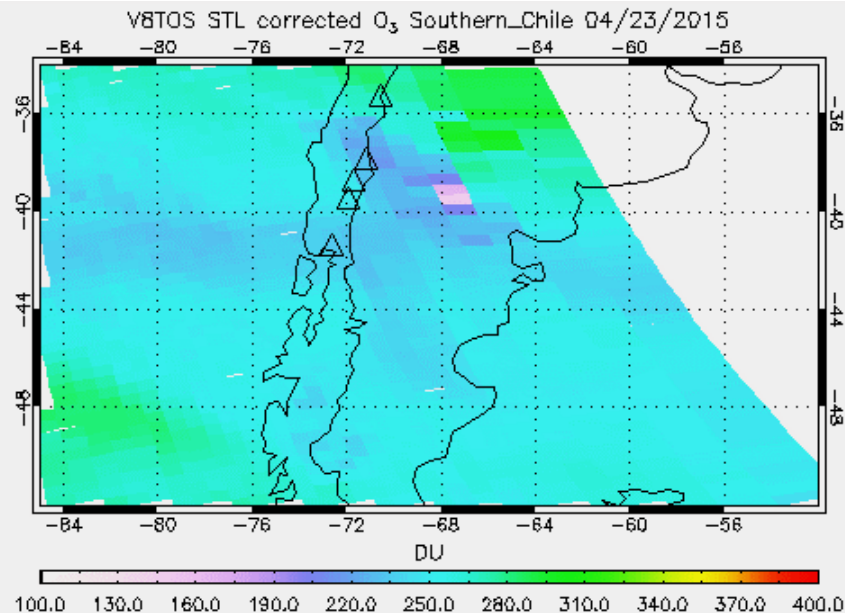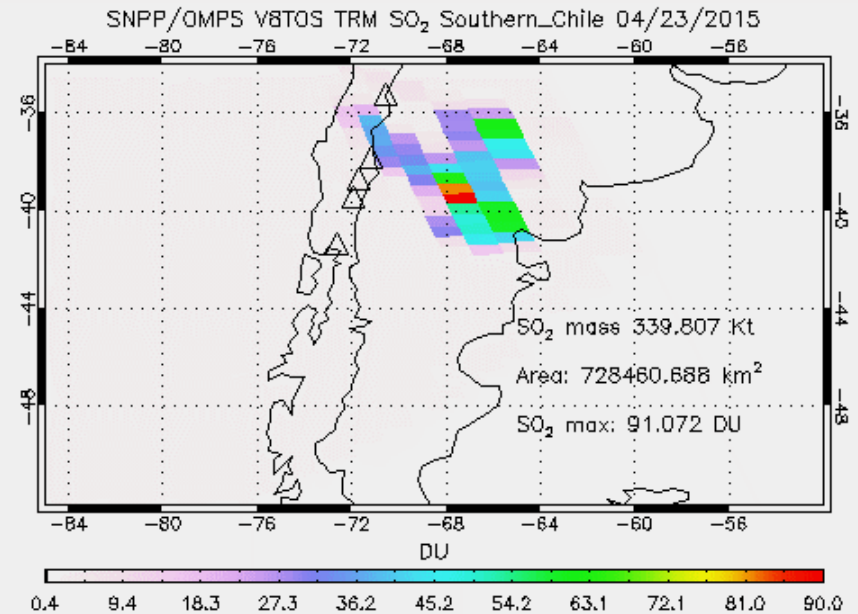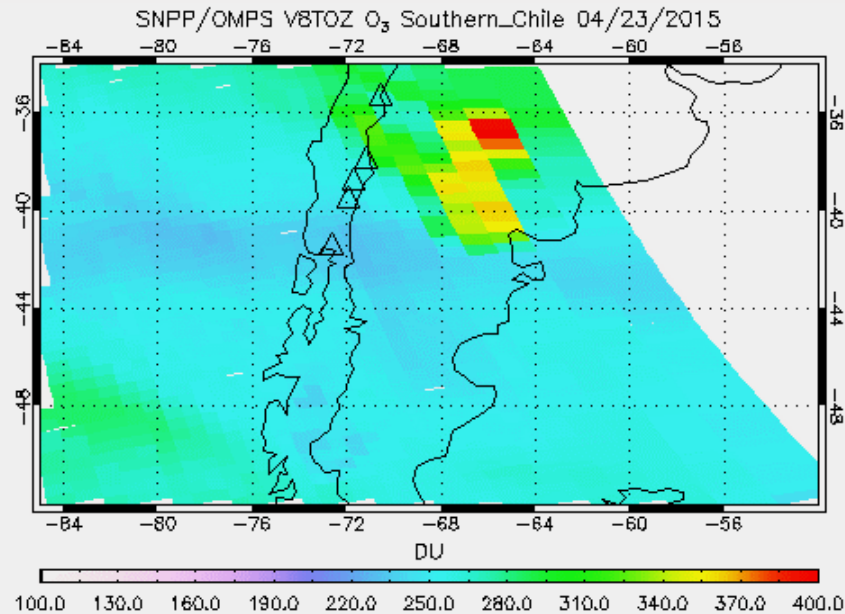

Blue NOAA Reprocessing
Green NASA Reprocessing

The V8TOz algorithm has been implemented at NDE and is used at STAR for reprocessing.

Monthly average percent differences for OMPS total ozone estimates for overpass data compared to NOAA Dobson Station in Boulder CO results are shown above.

Daily Maps of V8TOz Total Ozone products (top left – for March 14, 2017 NH Maxima, bottom left – October 16, 2016 SH Ozone Hole)

SO$_2$ Estimates and Ozone Corrections

SNPP/OMPS V8TOZ O$_3$ Southern_Chile 04/23/2015

SNPP/OMPS V8TOS TRM SO$_2$ Southern_Chile 04/23/2015

SO$_2$ mass 339.807 Kt

Area: 728460.688 km^2

SO$_2$ max: 91.072 DU

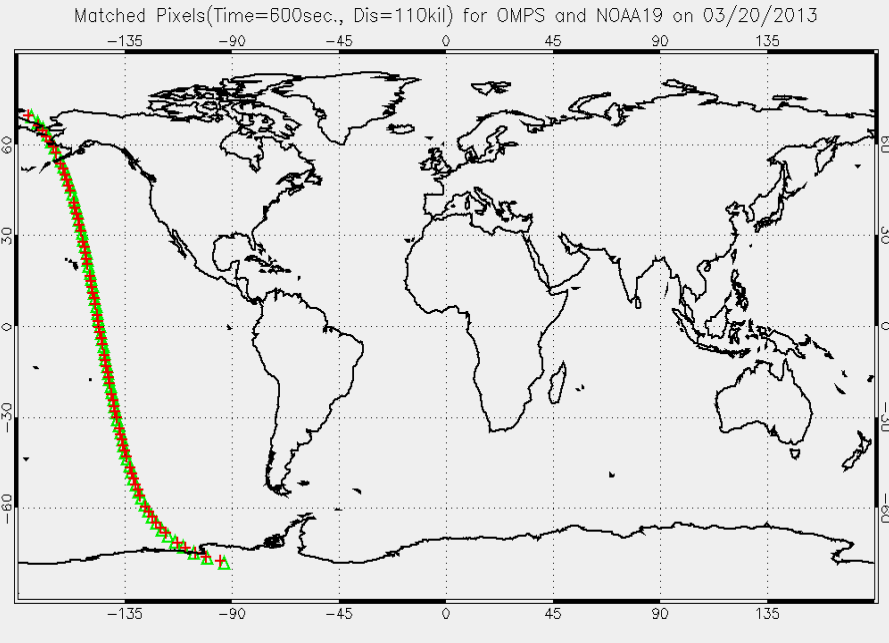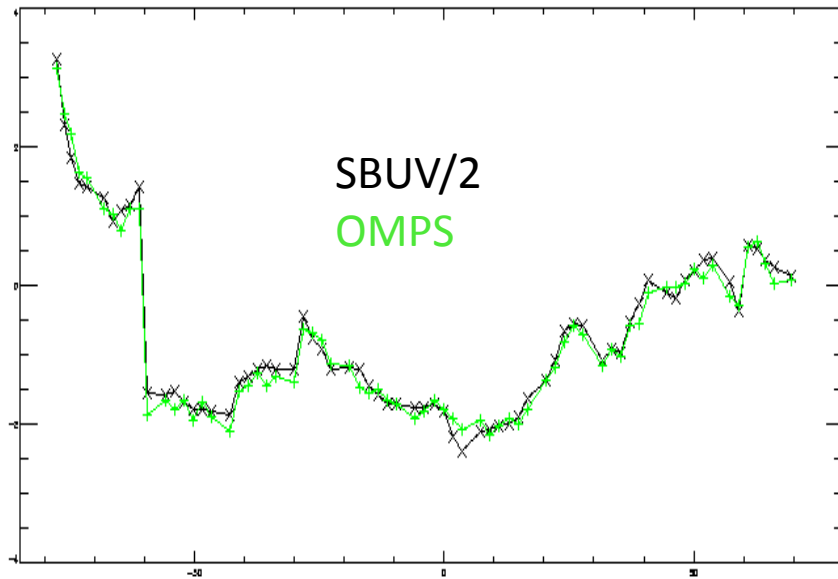V8TOS STL corrected O$_3$ Southern_Chile 04/23/2015

The LFSO2 algorithm has been delivered to NDE and is used at STAR for reprocessing.

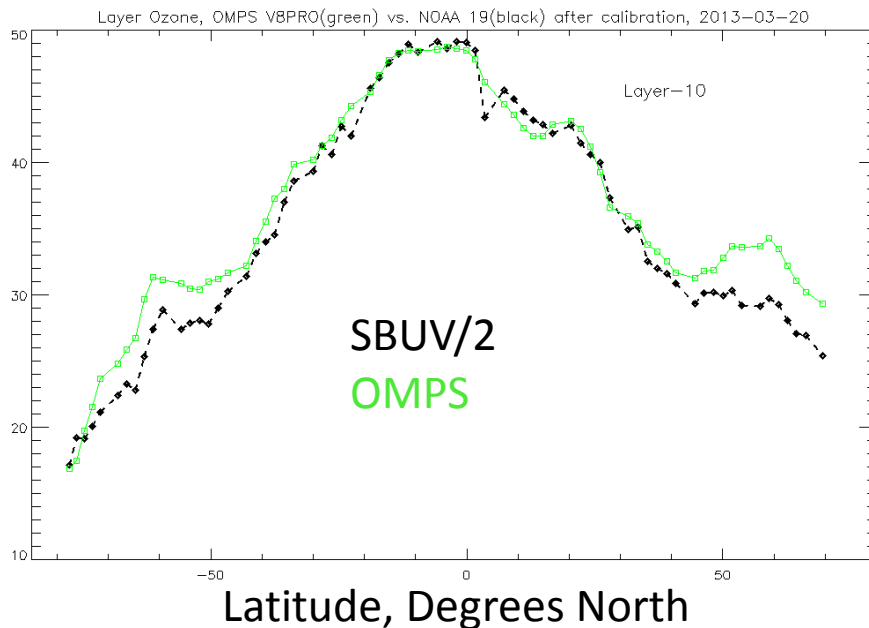LFSO2 Total Column SO$_2$ estimates for an eruption on April 23, 2015 are shown above.

Total Column Ozone estimates (top left – uncorrected; bottom left – corrected) show improved values with corrections taking SO$_2$ into account. There may be overcorrections for very high SO$_2$ levels.

Nadir Ozone Profile Comparisons for a Chasing Orbit

Matched Pixels(Time=600sec., Dis=110kil) for OMPS and NOAA19 on 03/20/2013

SBUV/2
OMPS

Layer Ozone, OMPS V8PRO(green) vs. NOAA 19(black) after calibration, 2013-03-20
Layer-10
SBUV/2
OMPS

The V8Pro algorithm has been implemented at NDE and is used at STAR for reprocessing.

The orbital tracks for NOAA-19 SBUV/2 and S-NPP OMPS for March 20, 2013 – above.

An adjustment is made to the get agreement in the measurement residuals (See the 288 nm channel residuals versus latitude – top left). This produces agreement in the retrieved layer ozone amounts (See the 16 hPa to 10 hPa layer amounts versus latitude – bottom left).

SOUNDINGS: NUCAPS
OVERVIEW

Lihang Zhou
and the Team
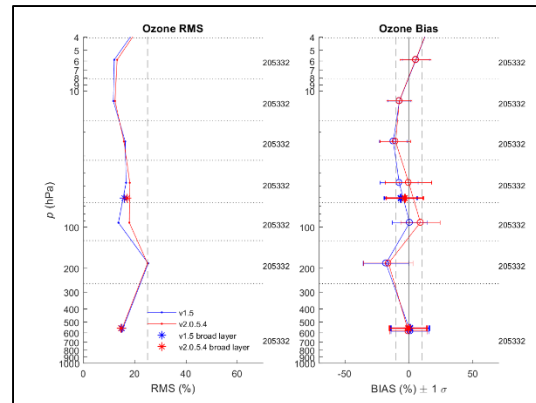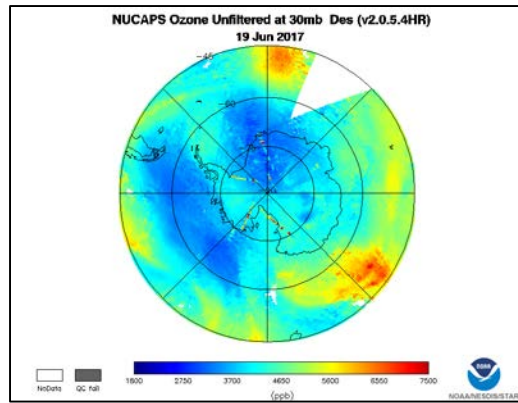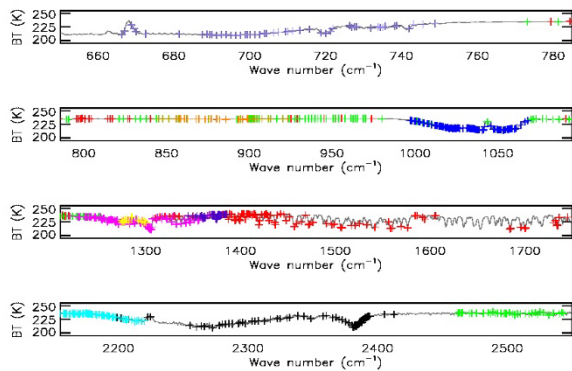
October 18th, 2016
NUCAPS O3 achieved validation status

Left: Monitoring O3 depletion from NUCAPS FSR (June 2017)
Right: NUCAPS FSR O3 validation (Nalli et al., IEEE, 2017)

January 2017
Final NUCAPS FSR Channel Selection delivered (610 chns)

March 31st, 2017
CrIS FSR NWP Channel Selection delivered (435 chns)

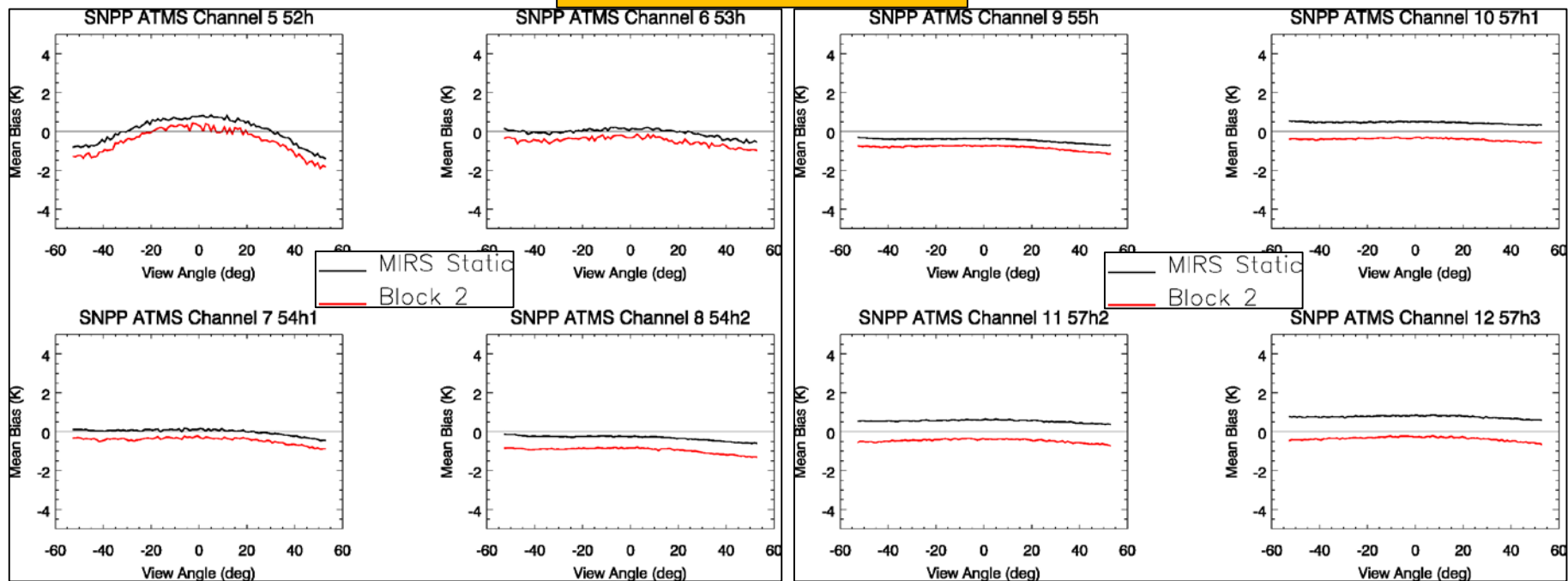**Left**: NUCAPS Operational Channel Selection (610 channels)

SOUNDINGS: MIRS
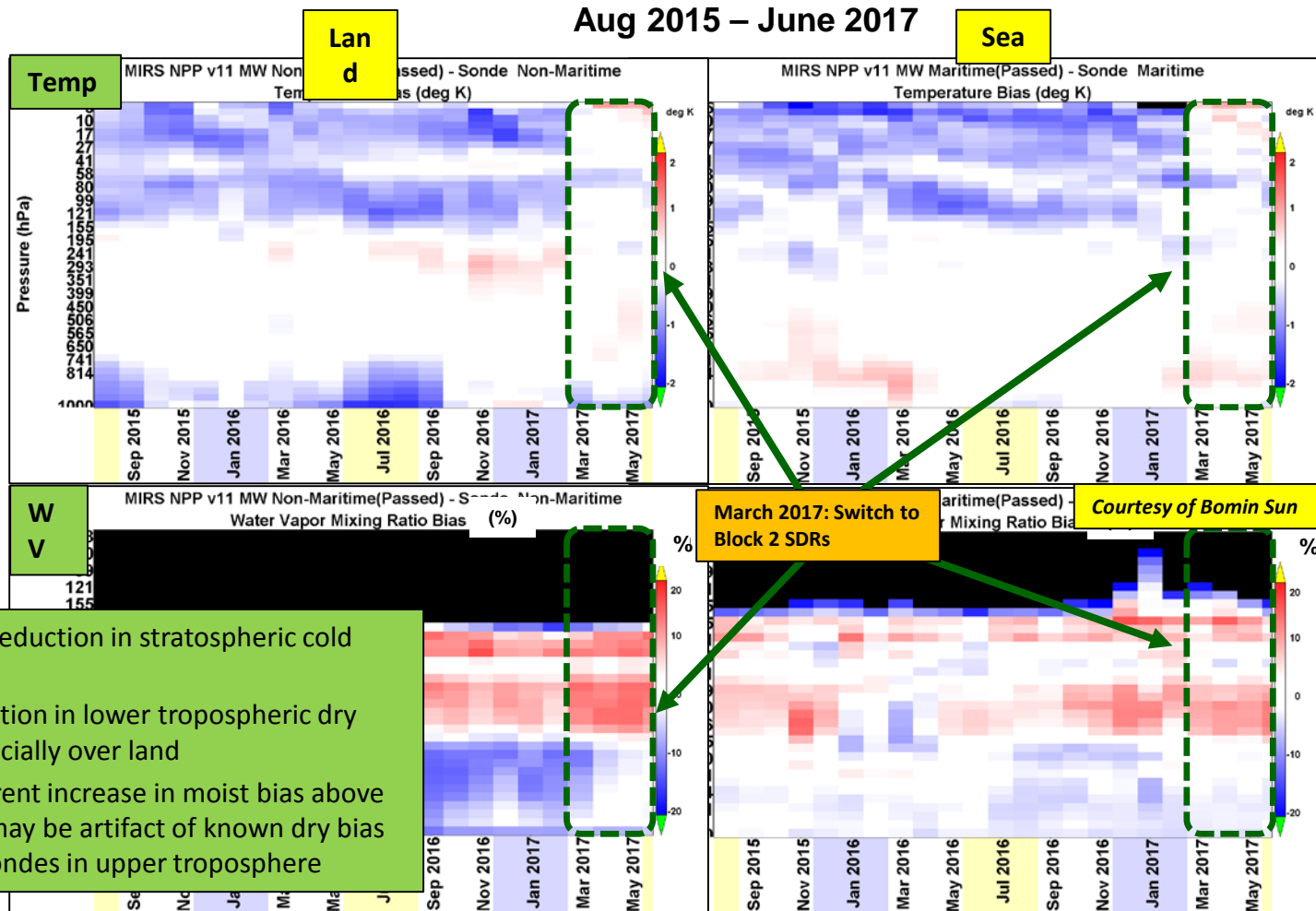# OVERVIEW

Mark Liu
and the Team

Microwave Integrated Retrieval System (MiRS):
Impact of ATMS Block 2 Calibration on T and WV Retrievals

- In March 2017 operational ATMS SDR calibration switched to Block 2 processing
- Comparison of MiRS radiometric bias corrections for T sounding channels (5-12): Block 1 (Static) and Block 2, OBS-SIMULATED
  - These corrections are subtracted from observed TBs prior to retrieval (i.e. negative means correction increases TB)
  - Block 2 corrections generally ~0.5 to 1 K lower than Block 1

Observed – Simulated (CRTM) SDRs

MiRS SNPP/ATMS Temperature and WV Bias vs. Raobs (NPROVS) : Aug 2015 – June 2017

Land

Sea

Temp

WV

MIRS NPP v11 MW Non-Maritime(Passed) - Sonde Non-Maritime Temperature Bias (deg K)

MIRS NPP v11 MW Maritime(Passed) - Sonde Maritime Temperature Bias (deg K)

MIRS NPP v11 MW Non-Maritime(Passed) - Sonde Non-Maritime Water Vapor Mixing Ratio Bias (%)

March 2017: Switch to Block 2 SDRs

Courtesy of Bomin Sun

- T profile reduction in stratospheric cold bias
- WV reduction in lower tropospheric dry bias, especially over land
- WV apparent increase in moist bias above 600 hPa may be artifact of known dry bias of radiosondes in upper troposphere

END