



DIRECTOR'S MESSAGE

CICS has been established on the premise that it will support NOAA's mission, starting from its daily activities to the larger aim of contributing to NOAA's vision for the future. Our CICS people have demonstrated high skills in developments related to the science of satellite sensors, earth observations, and integrated earth system science.

These facets, among others, represent a solid foundation for the construction of applications in support of weather, climate and/or agricultural monitoring, decision support systems and data assimilation. The institute, being in an academic environment, prioritizes training, mentoring and education as forms of outreach to the larger community and to prepare young scientists that in the future may join the NOAA workforce.

The two notes in this circular present examples of how links between basic science and operations are being developed: The first note shows the integration of satellite data into assimilation systems, and the second presents efforts to increase the creation of advanced satellite products for forecast operations. In a way, these reports reveal how CICS has

matured as it is reaching its tenth year of collaborations with STAR/NESDIS.

Hugo Berbery



2018 CICS Summer Interns

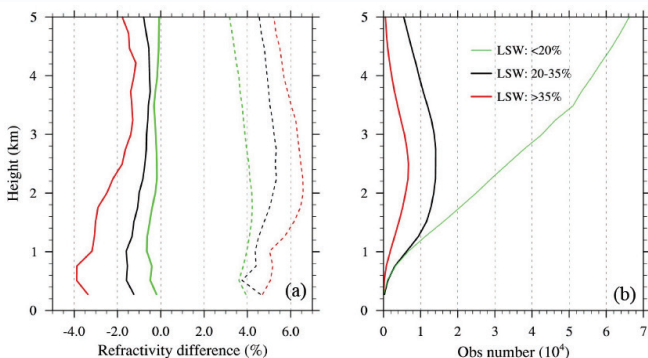
Impact of Bending Angle Measurement Uncertainty on Radio Occultation Data Assimilation in the Tropical Lower Troposphere

(Contributed by Dr. Xiaolei Zou)

The fluctuation of radio occultation (RO) signals in the presence of refractivity irregularities in the moist lower troposphere results in uncertainties of retrieved bending angle and refractivity profiles. The

local spectral width (LSW) of RO signals is a parameter to quantify the uncertainty (random error) in RO retrieved bending angle and refractivity profiles. Figure 1 shows the vertical distributions of the mean fractional refractivity differences between COSMIC RO and radiosonde data when LSW is less than 20%, between 20–35%, and greater than 35% below 5 km in the tropics (30°S–30°N) during the two-week period from January 2008 to April 2014. COSMIC refractivity observations with large LSWs (e.g., > 35%) have large negative systematic differences below 3 km compared with collocated radiosonde observations. By using an LSW-based quality control (QC) procedure to eliminate low-quality data (denoted LSWQC), the assimilation of COSMIC RO data through a two-week cycle produced more significant improvements for water vapor analyses in the moist tropical lower troposphere than the use of previous QC (STQC).

Liu, H., Y.-H. Kuo, S. Sokolovskiy, X. Zou, Z. Zeng, L.-F. Hsiao and B. C. Ruston, 2017: A quality control procedure based on bending angle measurement uncertainty for radio occultation data assimilation in the tropical lower troposphere. *J. Atmos. Oceanic Technol.*, (accepted in June 2018)



Vertical distributions of the (a) means (solid) and standard deviations (dashed) of the refractivity differences between RO and collocated radiosonde observations, and (b) data counts when LSW is > 35% (red), between 20–35% (black), and < 20% (green) from January 2008 to April 2014 and within 30°S–30°N.

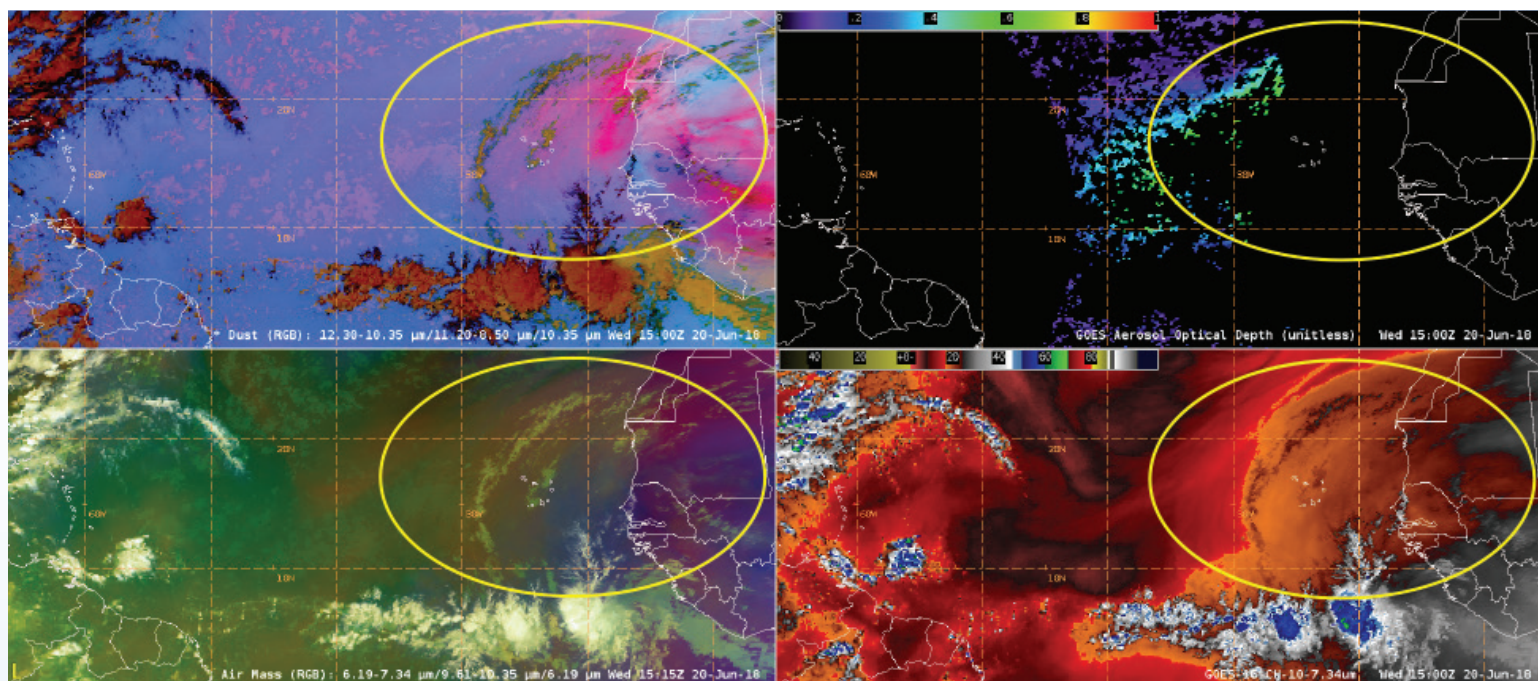
Tracking Saharan Dust Using New Satellite Tools

(Contributed by Michael Folmer)

CICS is providing support to the Satellite Proving Ground (PG) for Marine, Precipitation, and Satellite Analysis (MPS), which was established in 2011 to introduce new Joint Polar Satellite System and Geostationary Operational Environmental Satellite – R-Series satellite products to forecast operations at the National Weather Service (NWS) Ocean Prediction Center, Weather Prediction Center, Tropical Analysis and Forecast Branch (TAFB) of the National Hurricane Center and the National Environmental Satellite, Data, and Information Service Satellite Analysis Branch. The concept of the MPS PG was built around demonstrating and evaluating new satellite techniques and products, but as GOES-16 and NOAA-20 are being used more routinely, it's time to start focusing more on the forecast challenges and how these products or techniques will benefit the decision-making process. The Saharan Air Layer (SAL) which propagates off the west coast of Africa, affects tropical cyclone

formation and may lead to visibility and air quality issues from the Caribbean to the southern U.S. is the first forecast challenge that will be evaluated in 2018. TAFB, a few NWS weather forecast offices, and the Caribbean Institute for Meteorology and Hydrology are participating in this evaluation.

There are multiple dust and moisture products, such as the SAL Split-Window product and Layered Precipitable Water, that could be used to diagnose and analyze the SAL, but forecasters at TAFB have wondered which products are best. By conducting a weather-focused evaluation, the forecaster can pick from the list of available products and report their feedback on product performance. The goal of this evaluation is to identify products that could be combined to provide the best analysis and therefore help focus application-based training moving forward. The evaluation runs from 06/18/18 through 09/30/18.



An example of a 4-panel display from AWIPS II that allows forecaster to view multiple time-synchronized products at once. In this scenario, the Dust RGB (upper left), the GOES-16 Aerosol Optical Depth product (upper right), the Air Mass RGB (lower left), and the GOES-16 7.3 µm water vapor imagery are used to track the dust component and the dry air associated with the SAL (yellow ovals) as it advects off the west Africa coast.

CICS-MD BACKGROUND

The Cooperative Institute for Climate and Satellites-Maryland (CICS-MD) is engaged in collaborative research with several NOAA Centers and Laboratories. CICS-MD consists of about 60 scientists that implement the Institute's mission of supporting NOAA's ability to use satellite observations and Earth System models to advance the national climate mission. Full information, including our research topics, is available at cicsmd.umd.edu.

NOAA SPONSORS

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- Climate Prediction Center/National Centers for Environmental Prediction/National Weather Service
- National Centers for Environmental Information/NESDIS (NCEI)
- Air Resources Laboratory/Office of Oceanic and Atmospheric Research