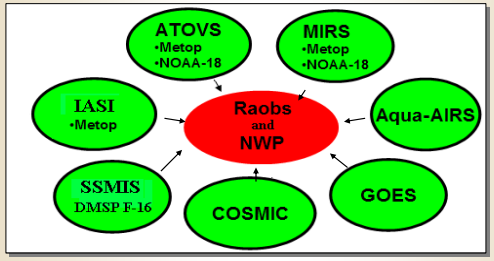
Noaa PROducts (integrated) Validation System (NPROVS)

Tony Reale, NOAA/STAR, Washington D.C. (tony.reale@noaa.gov)
Michael Pettey, Bomin Sun and Franklin H. Tilley, IMSG, Rockville, Maryland

Background

The Noaa PROducts (integrated) Validation System (NPROVS) operated by the Office of SaTellite Applications and Research (STAR) provides routine (daily) compilation of collocated radiosonde and derived satellite products (soundings) from a constellation of five (5) environmental satellites and ten (10) independently operated product systems.



This work is funded by the NOAA Integrated Program Office (IPO) in support of NPOESS Calibration and Validation of CrIS-ATMS Environmental Data Records (EDR) (with Chris Barnett, STAR).

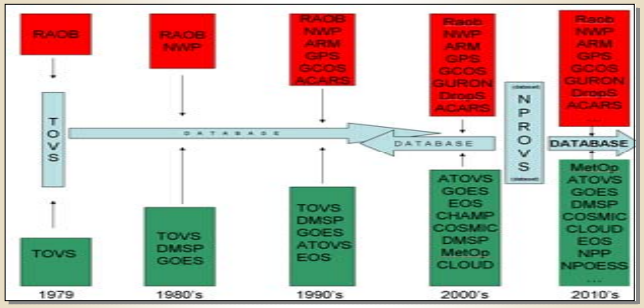
Phase-1: develop a centralized consistent capability for compiling a dataset of collocated radiosonde, NWP and current satellite derived weather products from GOES, Polar and GPS satellites

Phase-2: expand to a "relational database" of current radiosondes, ground-truth, NWP, satellite "measurement" and associated EDR's

NOAA STAR also supports the retrospective compilation of an historical "relational database" of collocated radiosonde, ground truth and satellite sensor observations and EDR's beginning with TOVS (1979) with plans to include DMSP, GOES and "other" observations (tbd).
http://www.orbit.nesdis.noaa.gov/smcd/opdb/poes/polarsearch/

The immediate goal is to provide consistent protocols for inter-comparing EDR's from the current suite of satellite and ground truth platforms in preparation for NPOESS

The longer term goal is to link past, present and planned future observations in a continuous historical record of collocated observations to support the creation of heterogeneous time series for climate



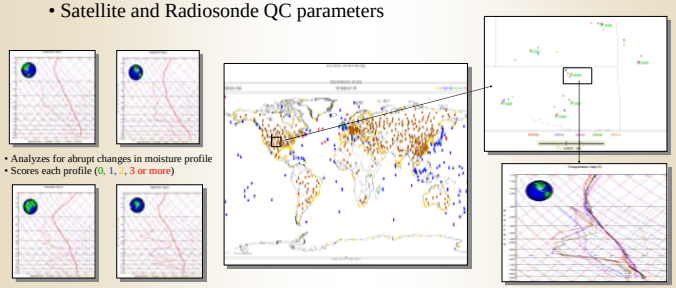
Capability

NPROVS accesses the following Satellites and Sounding Product Systems:

- Advanced TIROS Operational Vertical Sounder **(ATOVS) Operation**
  - •NOAA-18 and MetOp
- Advanced TIROS Operational Vertical Sounder **(ATOVS) R&D**
  - •NOAA-18 and MetOp
- Microwave Integrated Retrieval System **(MIRS) Operation**
  - •NOAA-18, MetOp
  - •Defense Meteorological Satellite Program (DMSP) F-16 (Special Sensor Microwave Imager Sounder (SSMIS))
- Geostationary Operational Environmental Satellite **(GOES) Operation**
- Atmospheric InfraRed Sounder **(AIRS) Experimental/Operation**
  - •NASA-Earth Orbiting Satellite (EOS) Aqua
- Infrared Atmospheric Sounding Interferometer **(IASI) Operation**
  - •MetOp
- Constellation Observing System for Meteorology Ionosphere and Climate **(COSMIC)**
  (provided by University Corporation for Atmospheric Research (UCAR))

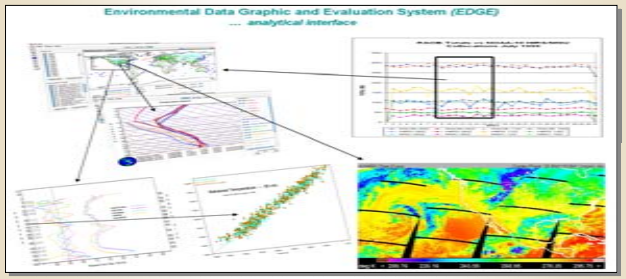
Respective satellite products are collocated with Global Raob (and NWP)

- one collocation per Raob/NWP per satellite
- consistent collocation strategies given spatial and temporal characteristic of satellite (i.e., GOES vs Polar vs COSMIC)
- Satellite and Radiosonde QC parameters



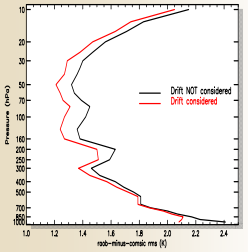
Routine Analysis/Display (Environmental Data and Graphical Evaluation (EDGE)

- geographic display of collocations and raw data
- user interface and sorting options (raob station, type, QC, satellite, time, distance)
- scatter plots and vertical statistics
- orbital data displays

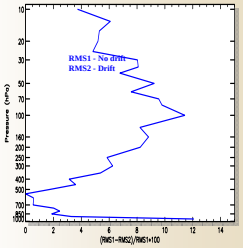


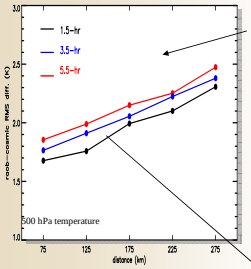
Results using NPROVS Collocation Datasets

Spatial Temporal Sensitivity Studies

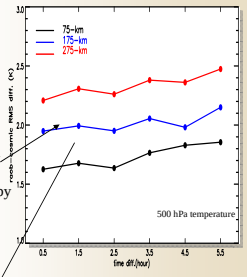


Impacts of compensating for the spatial and temporal drift of radiosondes (up to 100km and 3 hours) and the spatial drift of COSMIC radio-occultation observations (up to 200km) in the validation/comparison of Radiosonde versus COSMIC soundings reduces RMS up to 10%

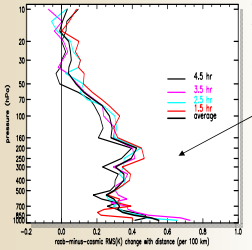




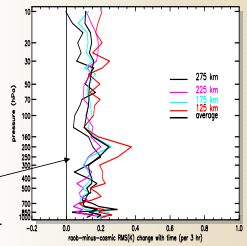
Spatial sensitivity of Raob-minus- COSMIC RMS difference is determined by the slope of the RMS vs. Distance plots for discrete time intervals



Time sensitivity of Raob-minus-COSMIC RMS difference is determined by the slope of the RMS vs. Time plots for discrete distance intervals



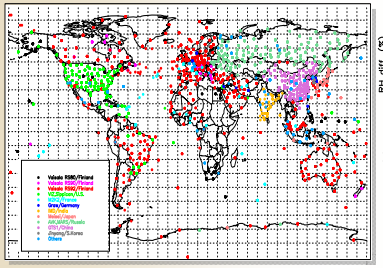
The "*rate*" of RMS change with distance is calculated for discrete Raob-COSMIC time intervals centered about 1.5hr, 2.5hr, 3.5hr and 4.5hr, respectively.

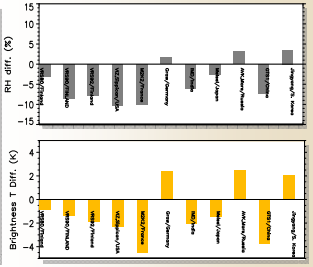


The "*rate*" of RMS change with time is calculated for discrete Raob-COSMIC distance intervals centered about 125 km, 175 km, 225 km and 275 km, respectively.

Based on "*COSMIC/Raob*" comparisons, the RMS difference in tropospheric temperature associated with a 1hr time difference is equivalent to 20km; this number increases with height in the stratosphere; similar studies using satellite observations are planned.

Identify Differences in Humidity Measurements Among Radiosonde Types





Biases shown in Raob types (upper right) are basically consistent with published field experiment findings and tend to be consistent with differences between calculated (using RT model) versus observed satellite radiances (bottom right) for Microwave Humidity Sensor (MHS) upper tropospheric channel (3).

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