NOAA Satellite Products Integrated Validation System

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Background

NOAA initiates the collocation of satellite and ground truth radiosonde observations for TOVS in 1979, and for DMSP and GOES in 1980's

- *Radiosonde screening and collocation strategies for polar satellites (TOVS and DMSP) are relatively primitive but consistent*
- *Screening and collocation strategies for GOES evolve independently and include collocated NOAA-NWP forecasts profiles*
- *Collocations the mainstay for product validation and for polar play an important role in scientific algorithm tuning*

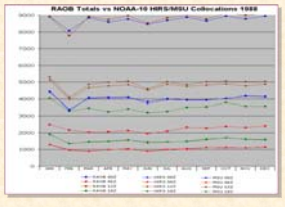
NOAA operational collocation systems for polar undergo significant changes in the 1990's culminating in revised approaches in conjunction with ATOVS operational systems in 1999 (NOAA-15) and into the 2000's

- *Time windows over land are reduced to 3 hours and improved collocation strategies in polar regions has a positive impact on datasets integrity*
- *Dedicated graphical validation systems (EDGE) emerge as pivotal operational monitoring tool for polar satellite collocation datasets*
- *Combined polar and GOES satellite product and validation system receive some interest but not pursued*
- *NOAA begins operating independent collocation systems for combined microwave and hyper-spectral (AIRS) sounding products from Aqua-EOS*

Study for Environmental Arctic Change (SEARCH) support effort undertaken at NESDIS (2004) in response to "climate-user" request for historical collocations of radiosondes and TOVS sensor measurements for HIRS and MSU (Francis and Schweiger)

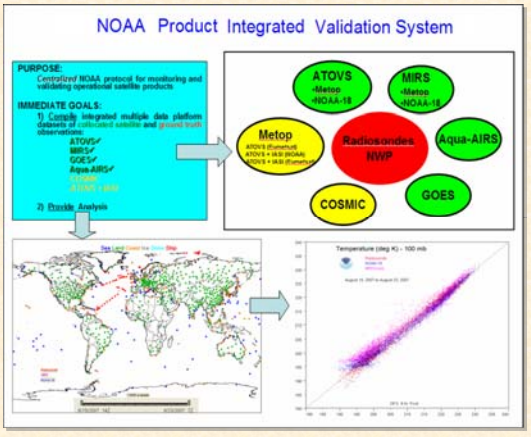
- *Effort culminates in the baseline of all TOVS 1b-level data and radiosondes on NOAA-STAR computer facility and the emergence of a "relational database" of respective sounder and radiosonde collocations*
- *Problems in compiling and utilizing the collocation are identified; troubleshooting continues*

http://www.orbit.nesdis.noaa.gov/smcd/opdb/poes/polarsearch/



NPOESS proposal (3-year) accepted to design and develop NOAAA satellite products integrated validation system for deployment in conjunction with next generation NPOESS product systems

- *Phase -1 develops a single consistent capability for collocating radiosondes and NWP with satellite sounding products from GOES and Polar (ATOVS, Aqua-EOS, COSMIC…) platforms … the main topic of this poster*
- *Phase-2 expansion to a "relational database" of respective sounder measurement (1b-level) and ground truth collocations which include inter-satellite collocation*
- *Funding cuts limit phase-2*



Current NOAA Satellite product Integrated capability includes the routine daily access of NOAA sounding products from

- ATOVS (NOAA-18 and Metop)
- various ATOVS test systems (including Microwave Integrated Retrieval System (MIRS)
- GOES
- experimental Aqua-AIRS
- Metop IASI products (NOAA vs EUMETSAT (pending))
- COSMIC

Collocation of each of the above with global radiosonde observations

- one collocation per sonde per satellite
- consistent collocation strategies in polar regions (multiple candidate orbits)
- *consistent collocation strategies given spatial and temporal characteristic of respective platforms (i.e., GOES vs. Polar vs. COSMIC)*
- respective data platform screening

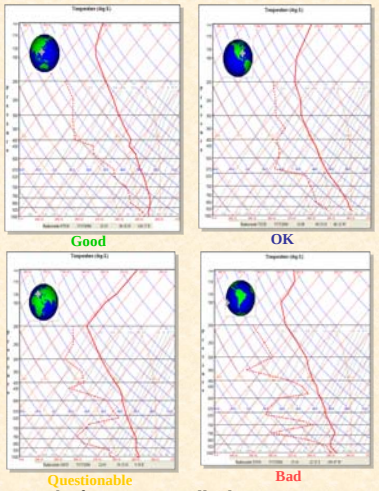
The inter-collocations of the respective satellite contained in collocation with each other

Routine analysis and display of collocated observations (EDGE)

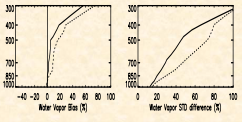
- geographic display of collocations
- user interface sorting (raob instrument type, screening, satellite platform, time and distance
- scatter plots and vertical statistical analysis of user selected collocations

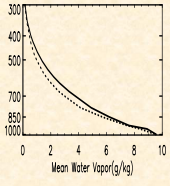
New RadiosondeMoisture Screening Technique

(Reale and Tilley … draft available upon request)

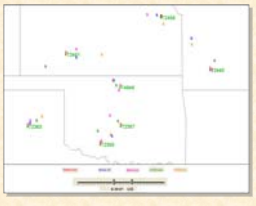


- Looks for monotonically decreasing moisture
- Analyzes for abrupt changes in moisture profiles
- Scores each profile (0, 1, 2, 3 or more)

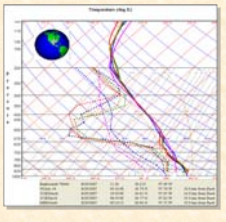




Good (solid; 0,1) versus suspicious (dash 2,3…) radiosondes versus NWP



Example (left) of collocated observations from multiple data platforms at seven (7) Radiosonde locations in the vicinity of South Great Plains ARM site (74646). Each color-coded "S" corresponds to the sounding location from each of the five (5) respective platforms. Notice that the same NOAA-18 ATOVS sounding is collocated with radiosonde sites 72357 and 72355.



Example (right) of collocated profiles at the ARM site (74646) including the 6-hour NWP forecast (darkest blue)

Potential Research Topic Areas Using NOAA Integrated Validation Datasets

Radiosonde (Moisture) Screening and Impacts
Raob Instrument Type Performance

Spatial / Temporal Sensitivity Studies (support GCOS Reference network initiatives)
Respective Platform Measurement / Product Uncertainty

RT Model Validation

Derived Product Integrated Validation
Derived Satellite Product Tuning and Research

Compiling Historical (from 1979) Collocation Data Records

- Radiometer Sensor Spectral Response Function Studies
- Retrospective Satellite Processing for Climate