PREPARISON OF NPOESS/NPP CROSS-COMPARISON WITH OTHER SATELLITE INSTRUMENTS

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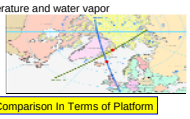
What Cross-Comparison Can Do

- To provide early on orbit quick look of NPP/NPOESS instruments & algorithms performance by comparing with other well understood/calibrated instruments & validated products.
- Independently and continuously calibrate, validate, & monitor NPP/NPOESS instruments, algorithms performance.
- Independent evaluation for the transfer of trends from EOS through NPP, to NPOESS
- NPP/NPOESS to be important part of WMO Global Space-based Inter Calibration System (GSICS)

NPP over fly A-Train, NPOESS C1 over fly NPP, providing unique opportunity for cross comparison.

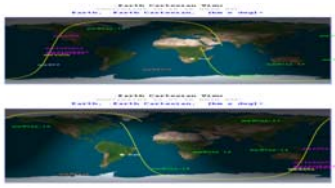
Environmental Satellite Data Records: from EOS, through NPP, to NPOESS

- **Comparison of instruments on the same platform:** CrIS/ATMS/VIIRS, Similar approaches as AIRS/AMSU/MODIS
- **SNO method:** Simultaneous Nadir Overpass eliminates issues with viewing angles, atmospheric paths observation time and location
- **Cross-Comparison with A-Train instruments:** Very useful for aerosols, clouds, temperature and water vapor

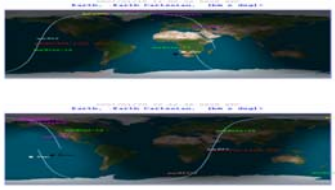


Different Ways To Carry Out Cross-Comparison In Terms of Platform

NPP Over fly A-Train Satellites



NPOESS-C1 Over Fly NPP



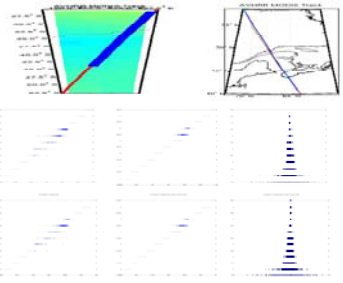
The Simultaneous Nadir Overpass (SNO) method

- SNO – every pair of POES satellites with different altitudes pass their orbital intersections within a few seconds regularly in the polar regions (predictable w/ SGP4)
- Precise coincidental pixel-by-pixel match-up data from radiometer pairs provide reliable long-term monitoring of instrument performance
- The SNO method has been used for operational on-orbit longterm monitoring of imagers and sounders (AVHRR, HIRS, AMSU) and for retrospective intersatellite calibration from 1980 to 2003 to support climate studies
- The method is also expanded for SSM/I with Simultaneous Conical Overpasses (SCO)

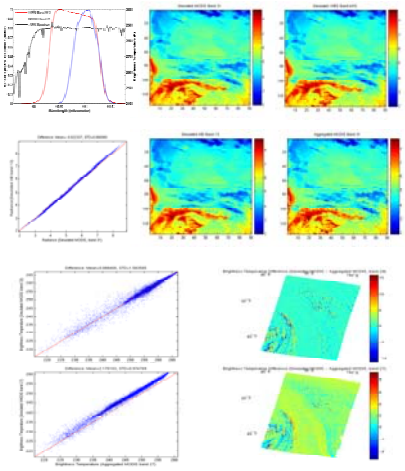
SNOs occur regularly in the +/- 70 to 80 latitude

3

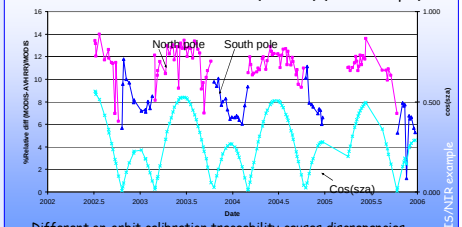
NOAA18 Over Fly AQUA AVHRR/3 VS MODIS



Upper: Simulated MODIS(31), VIIRS(M15), ABI(13) From AIRS Spectral: Lower: AIRS simulated MODIS compared with aggregated MODIS



Discrepancies between MODIS and AVHRR SNO time series for channel 1 (0.68um) (N16 vs. Aqua)

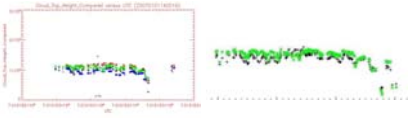


Different on-orbit calibration traceability causes discrepancies between MODIS and AVHRR. Seasonal variation may be related to SRF difference, polarization, BRDF effects

11

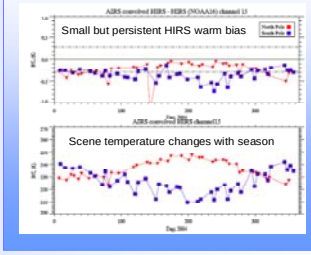
SNO VIS/NIR example

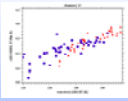
Cloud Top Height: CloudSat, CALIPSO, MODIS, AIRS Compared (Preliminary Framework)



MEAN in difference H(cs)-H(modis) 626 (meter) STDDEV 767 (meter)

Inter-calibrating AIRS and NOAA16/HIRS





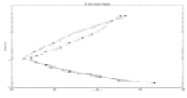
- Bias is scene temperature dependent
- Possible causes: nonlinearity, spectral response uncertainties, or blackbody.

16

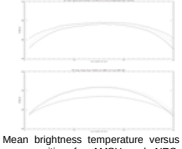
Courtesy of Wang, et al.

SNO Infrared example

AIRS & MASU COMPARISON: AMSU Along Scan Bias Can Be Seen



Mean brightness temperature at nadir versus pressure level of the max. weighting function for AIRS and AMSU selected channels. Solid AMSU; dashed AIRS; dotted lines are simulated from ECMWF for AIRS and AMSU, respectively. A day worth of data is used. Clear, ocean nadir scenes between 30 N and 30 S are selected.



Mean brightness temperature versus scan position for AMSU and AIRS. Clear ocean views between 30 N and 30 S are selected (2002 09 06). Solid, AMSU; Dashed, Airs; Dotted, ECMWF sim

Planning

NPP pre-launch readiness (Focus on EOS & A-Train to NPP)
NPP post launch early on-orbit comparison
NPP to NPOESS cross comparison readiness
Long term monitoring

SDR Cross-Comparison Plan

CrIS, AIRS, IASI comparison
VIIRS, MODIS, AVHRR/3 comparison
ATMS, AMSU comparison
CrIS, AIRS to VIIRS & MODIS comparison (using hyperspectral sounders to benefit imagers)
OMPS in progress

EDR Cross-Comparison Plan

As many EDRs as possible
Priorities (in order)
SST to help SDR comparison (MODIS, AVHRR, SeaWiFS)
Cloud & Aerosol EDRs, (available A-Train instruments)
NDVI, Snow Cover, Active fires to help SDR comparison (MODIS)
AVTP, AVMP (AIRS, IASI)
Ocean Color, difficult product (MODIS, SeaWiFS)
Others

NGST and NOAA/NESDIS working together to leverage capabilities, tools, and knowledge to establish global space-based cross-calibration and long term monitoring systems.