



Current Status of Cloud Properties from VIIRS on JPSS-1 for CERES



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Background

- The Clouds and the Earth's Radiant Energy System (CERES) generates a radiation and cloud climate data record extending from 2000 – present
 - requires a consistent, accurate set of measurements and analyses
- Radiation component is based on measurements from nearly identical broadband radiometers on Terra, Aqua, NPP, and JPSS-1 (N20 after launch)
- Cloud component relies on MODIS on Terra & Aqua, VIIRS on NPP & JPSS-1
- Assuming Aqua fails in the near future, NPP and JPSS-1 will continue the record. Cloud property retrievals from NPP and JPSS-1 must be consistent so that changes in time series are not due to satellite changes
- Eventually, NPP, JPSS-1, Aqua, and Terra must produce consistent results

Data

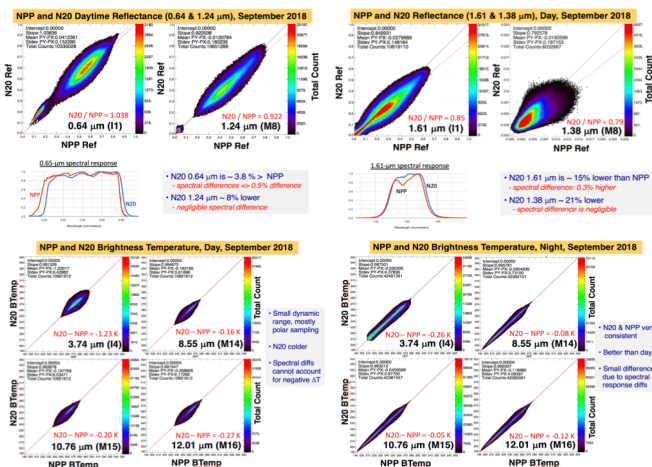
Channels used in CERES-VIIRS cloud retrievals

Reflectance	Brightness Temperature
0.64 μm (I1)	3.74 μm (I4)
1.24 μm (M8)	8.55 μm (M14)
1.61 μm (I3)	10.763 μm (M15)
1.378 μm (M9)	12.013 μm (M16)

Consistent cloud properties require consistent VIIRS ref & bTemps from NPP & N20

- Conditions for matching pixels between VIIRS on N20 & NPP
 - Time \leq 1 hour
 - Solar zenith & view zenith angles \leq 50°
 - Azimuth angles \leq 7.5°
 - average in 5 minute grid box
- Data used for N20 & NPP
 - VIIRS September 2018

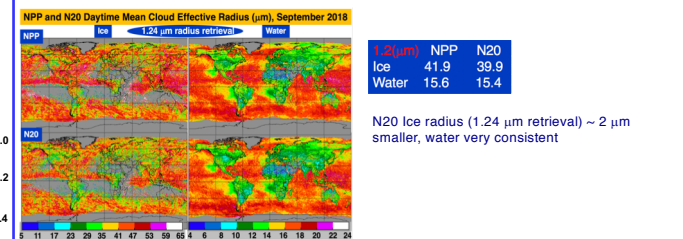
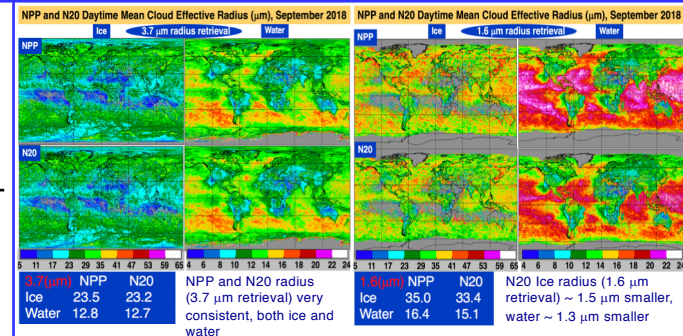
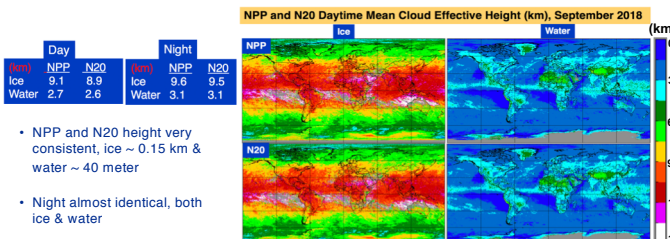
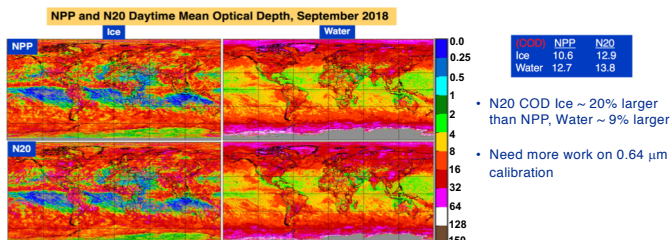
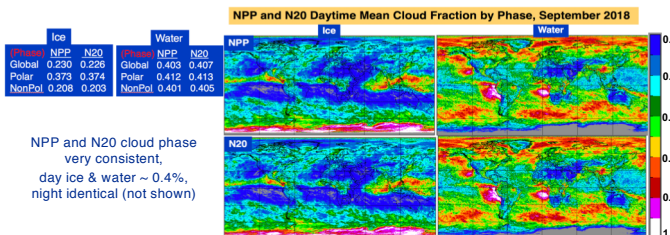
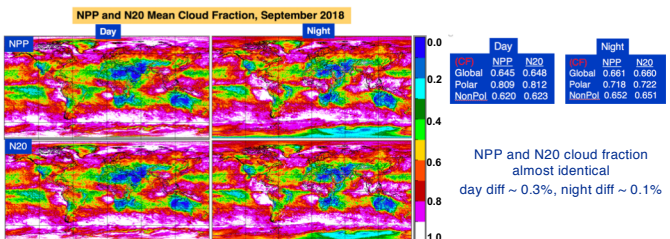
Channel Comparison



Preliminary Calibration on N20 VIIRS

Reflectance	Brightness Temperature
0.64 μm decrease 3.8%	3.74 μm no change
1.24 μm increase 8%	8.55 μm no change
1.61 μm increase 15%	10.763 μm no change
1.378 μm no change	12.013 μm no change

Cloud Property Comparisons between VIIRS on N20 & NPP



Summary

- N20 solar channels (reflectance):
 - 0.6 μm ~3.8% higher, 1.6 μm ~15% lower, 1.38 μm ~21% lower, 1.24 μm ~8% lower
- N20 thermal channels (brightness temperatures) are quite consistent with NPP
- With preliminary calibration (by CERES team),
 - a) Cloud Fraction, Phase, Effective Height & Effective Radius (3.7 μm retrieval) almost identical (within ~ 0.3%)
 - b) Cloud Optical Depth:
 - N20 ~ 20% larger for ice & 9% larger for water
 - a) Cloud Effective Radius
 - 1.6 μm retrieval: N20 Ice ~ 1.5 μm smaller, water ~ 1.3 μm smaller
 - 1.24 μm retrieval: N20 Ice ~ 2 μm smaller, water very consistent
- Need to wait for longer & more stable N20 data to derive final calibration so far, only 7 months of N20 VIIRS, May – November 2018

Future Plans

- N20 Solar Channels' Calibrations
 - account for spectral differences
 - normalize both NPP and N20 to Aqua
 - use more months of data to determine trends
- Finalize N20 cloud algorithms
 - begin processing of CERES N20 Edition 1 and NPP Ed2 clouds
 - feed into CERES N20 radiation budget analyses
 - begin validations of N20 VIIRS products
 - release N20 Ed1 SSF product
- Examine other properties: Multilayer clouds & ice and liquid water path
- Develop VIIRS compatible code for MODIS
 - will enable a nearly seamless record from 2000/2002 (Terra/Aqua)