



JPSS STAR Science Team Annual Meeting Cloud EDR Team

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Outline



- Overview
 - Products, Requirements, Team Members, Users, Accomplishments
- SNPP Algorithms Evaluation:
 - Algorithm Description, Validation Approach and Datasets, Performance vs. Requirements, Risks/Issues/Challenges, Quality Monitoring, Recommendations
- Future Plans
 - Plan for JPSS-1 Algorithm Updates and Validation Strategies, Schedule and Milestones
- Summary



Our Teams



- VIIRS Cloud Mask Team
 - Tom Kopp Lead & William Thomas JAM
 - STAR: Andrew Heidinger, Mike Pavolonis
 - NGAS: Keith Hutchison & Barbara Islager
 - Raytheon: Kurt Brueske
 - CIMSS: Rich Frey, Denis Botambekov, Corey Calvert
- VIIRS Cloud EDR Team
 - Andrew Heidinger Lead & Janna Feeley JAM
 - STAR: Dan Lindsey
 - NGAS: Eric Wong
 - CIRA: Steve Miller, Curtis Seeman, and Y.J. Noh
 - CIMSS: Bob Holz (Val Lead and NPP PEATE Liason), Min Oo, Greg Quinn, Andi Walther, Yue Li



Our Products



- VIIRS Cloud Mask (4-level) + decision bit flags
- VIIRS Cloud Type
- Daytime optical depth and particle size
- Nighttime optical depth and particle size
- Cloud Height/Temperature and Pressure
- Cloud Base
- Cloud-cover in layers (no IP)
- IPs are available at pixel resolution
- EDRs are 6 km



Our Processing Options



- **IDPS** runs the NPOESS algorithms modified with some NOAA-based modifications.
- GOES-R AWG algorithms are being implemented into the **NDE SAPF** led by Walter Wolf.
- **CLAVR-x** runs NOAA-heritage / GOES-R AWG VIIRS algorithms within Community Satellite Processing Package (**CSPP**).
- Our NDE algorithms are “enterprise” and support many geo and leo sensors. We do consider our program to span all of these sensors.
- We do expect to continue the POES climate records with VIIRS within the **PATMOS-x** project.
- We are also involved in the NPP Atmospheres Science Team which runs MODIS-heritage algorithms + the GOES-R AWG VIIRS Cloud height (**MODAWG**).



Accomplishments



- **VCM tuned and modified throughout S-NPP, achieved Val Stage 2 in January.**
- **VIIRS Cloud Products have undergone fewer but more major updates. Most are Provisional.**
 - **Adopted CLAVR-x form of inversion logic for low cloud heights**
 - **Adopted CLAVR-x DAY COP LUTS for conversion into the final IDPS Day COP LUTS**
 - **Updated k-ratio for ice microphysical model based on Ping Yangs data. (Which also similar to what is done in CLAVR-x)**
 - **Fixed some major coefficient bugs in Night COP**



Our Users

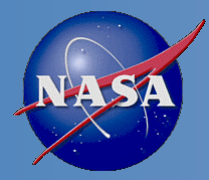


- VCM serves downstream applications.
- We know of no one using the IDPS cloud products operationally yet (they are provisional).
- We do have users of NOAA heritage algorithms.
 - NOAA cloud algorithms are in CSPP via CLAVR-x. CSPP CLAVR-x provides AVHRR, MODIS and VIIRS support.
 - Height, Type and daytime COP go into NWS WFO's for the Proving Ground Projects.
 - Global geo cloud altitude goes into NWS AWC.
 - We intend to include VIIRS in a Alaska Region morphed cloud product service beginning next year.
 - We need more users. We would be happy to collaborate with NCEP in their use of VIIRS SDR for cloud detection and cloud height estimation.



Algorithm Evaluations





Algorithm Evaluations Summary



1 = Keep NPOESS-era; 2 = Transition due to Performance; 3 = Transition for Other Reasons

Algorithm	Now -August 14	September 14+	NDE/JPSS
VCM	1	1	1/3
Cloud Type	1	1	1/3
Cloud Height	1	2/3	2/3
Day COP	1	2/3	2/3
Night COP	1	2	2
Cloud Base	1	2	2

- 1/3 for VCM in JPSS-1 means we will pursue the best NDE mask we can but decision should come from Application Teams
- 2/3 for Height and COP means that if planned changes to IDPS are successful, the main performance concerns may be mitigated and our decision for NDE is based more on other factors.



VIIRS Cloud Mask/Type Justification



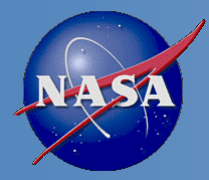
- We believe we should stay the course with VCM until the Applications Teams are ready and willing to switch the NDE cloud mask.
 - The VCM is at Val Stage 2
 - The teams have self-calibrated to the VCM
 - The VCM is based on MODIS-heritage and the team is capable of tuning and evolving the mask further.
 - However, the IDPS does limit the long-term development and some of the VCM issues are not present in the NDE mask.
 - We plan to revisit this decision once the NDE mask is up and running and the Application Teams are ready to evaluate.



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VCM Justification

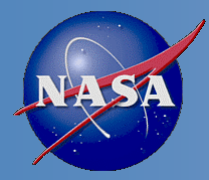


Overall: VCM meets the specification and Application Teams expressed their satisfaction

VCM Overall Results (Daytime) / Taken from Provisional

Requirement	Level 1	Match-Up	Golden Granule
PCT: Daytime, ocean	94%	95.3%	96.5%
PCT: Daytime, land	90%	93.9%	94.4%
PCT: Daytime, desert	90%	96.0%	95.7%
Leakage: Daytime, ocean	1%	0.6%	0.1%
Leakage: Daytime, land	3%	2.2%	0.7%
Leakage: Daytime, desert	3%	2.8%	1.2%
False Alarms: Daytime, ocean	5%	3.5%	2.6%
False Alarms: Daytime, land	7%	3.6%	4.2%
False Alarms: Daytime, desert	7%	1.2%	2.9%

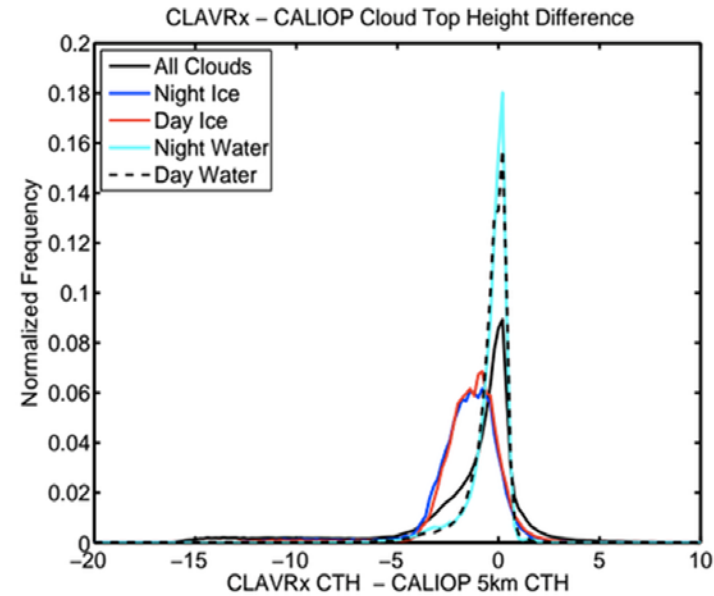
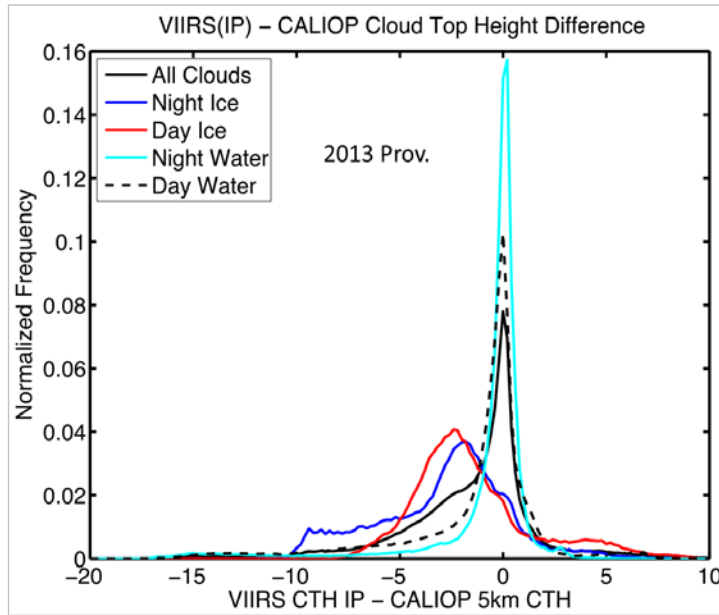
Filter: No Probably Clear or Cloudy and COT > 1



VIIRS Cloud Height Justification



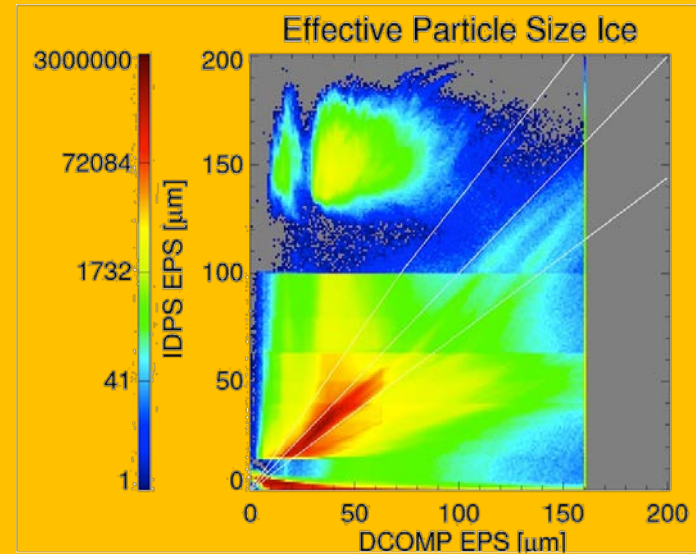
- NDE/CLAVR-x is still outperforming NPOESS-era algorithm in IDPS.



- However, the NPOESS-era IR RTM is not correct and needs updating. We feel this could fix some of the issues seen above.
- We expect to make to be able to make this RTM change prior to August 2014.

- Very similar story to Height. NDE/CLAVR-x is still outperforming NPOESS-era algorithm in IDPS.

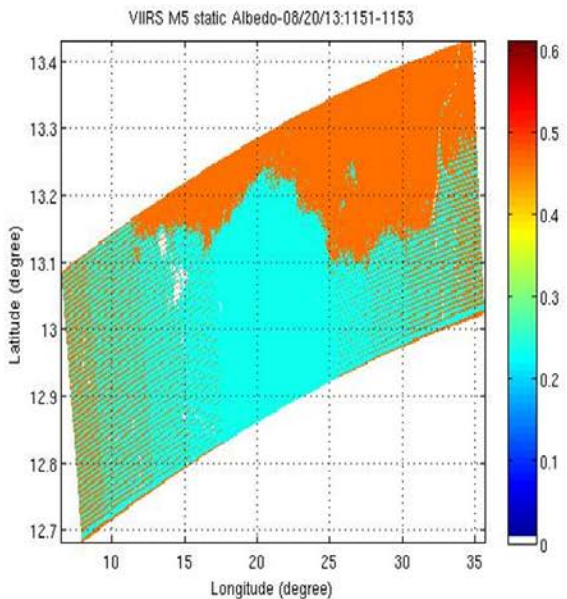
- NPOESS-era algorithm Cloud EPS shows artifacts not seen in DCOMP (NDE) or other algorithms.
- This after adoption of DCOMP LUTs.
- ***We suspect these are failed retrievals due to bad surface reflectance assumptions.***
- Roughly 1/3 of pixels fail now.



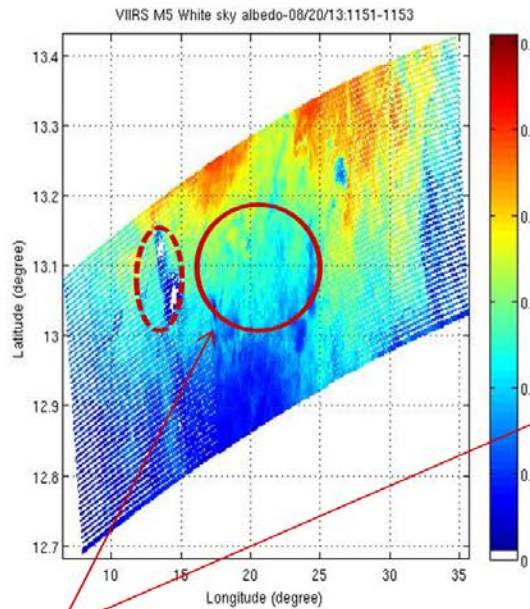
- However, the NPOESS-era surface reflectance assumptions are not valid and need updating. Use of the existing white-sky reflectance is being explored. Another option is adoption of the static white-sky data used in CLAVR-x.
- We expect to make this white-sky change prior to August 2014.

- Current IDPS Surface Reflectance is unrealistic
- We propose adopting what is done in CLAVR-x and use a white-sky reflectance
- We are exploring using the standard VIIRS white-sky product
- Initial analysis indicates this is main driver of the day COP failures over land.

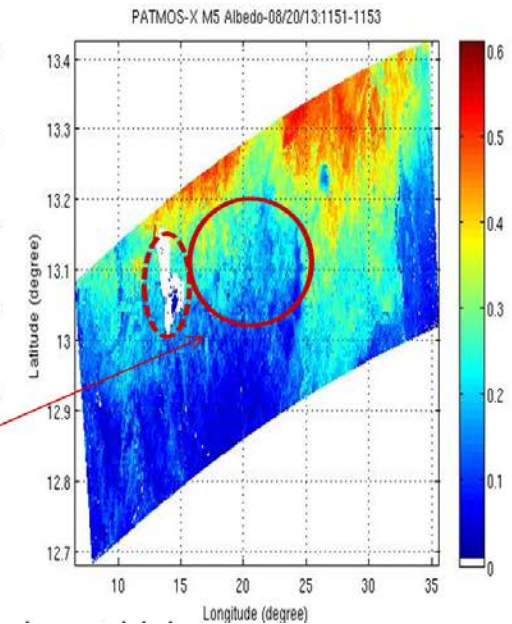
Current IDPS M5



M5 White-Sky from IDPS

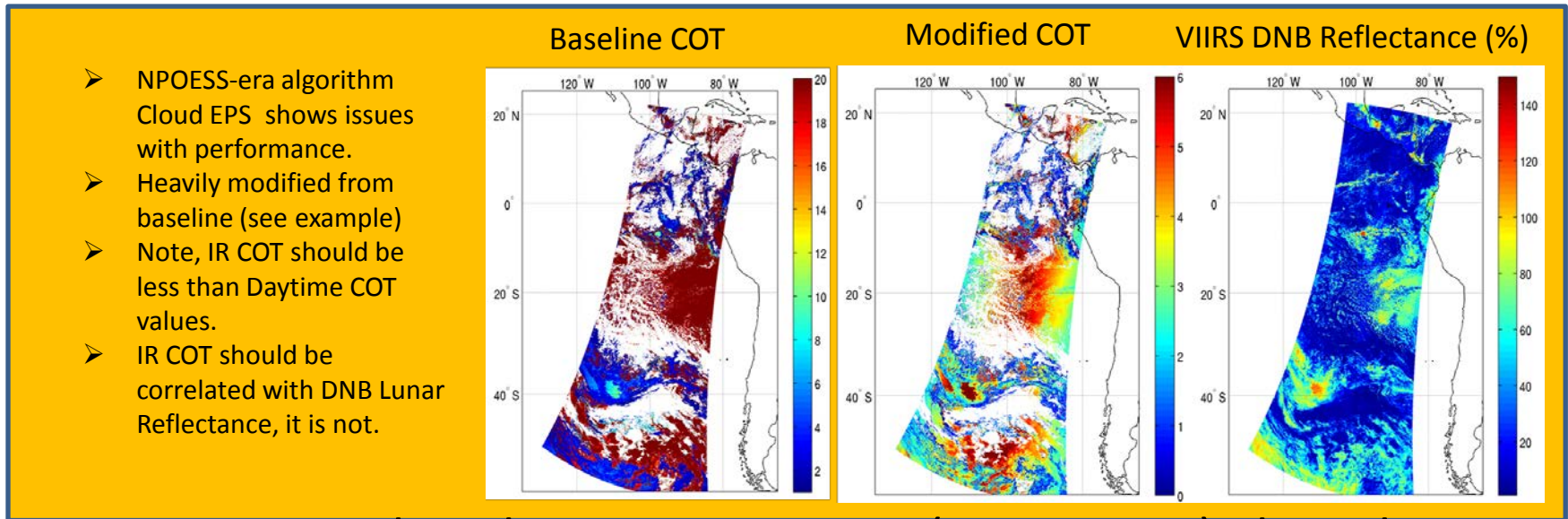


M5 Current CLAVR-x



Areas of Difference Remain between CLAVR-x and VIIRS White Sky and will be explored

- NPOESS-era IDPS Nighttime COP Algorithm is still not performing well. Did not achieve Provisional Status.



- NDE approach is the use Pat Minnis (NASA LaRC) algorithm which is same as GOES-R AWG.
- We think NDE approach is they way to move forward.
- Limitations of IR-only approaches will remain.



VCM Path Forward



- Continue on with IDPS VCM, evaluate NDE in the future.
- Primary function of the validation team in the next few months is twofold
 - Complete tuning for nighttime scenes
 - Address specific concerns from VIIRS Cal/Val teams
 - Cloud edges over water
 - Excessive leakage over snow/ice, including polar night
- Pursue quantitative validation of cloud phase and aerosol quality flags (validation stage 2)
- Continue to interact and be responsive to other VIIRS EDR team needs
 - The VCM must continue to address items where the downstream EDRs believe improvement is needed for their products to reach validation stage 1



Cloud Product Path Forward



- We will continue to push hard for two major fixes before NGAS support is gone (surface refl. and IR RTM).
- These fixes are required if Val Stage 1 for CTH and Day COP is to be met for NPOESS-era algorithms.
- We believe we have the go-ahead to transition to supporting NOAA-endorsed NDE algorithms.
- We want to go Val Stage 1 with those if the NDE schedule allows this.
- We'll continue to push forward on the NDE cloud mask and allow teams to weigh when appropriate.

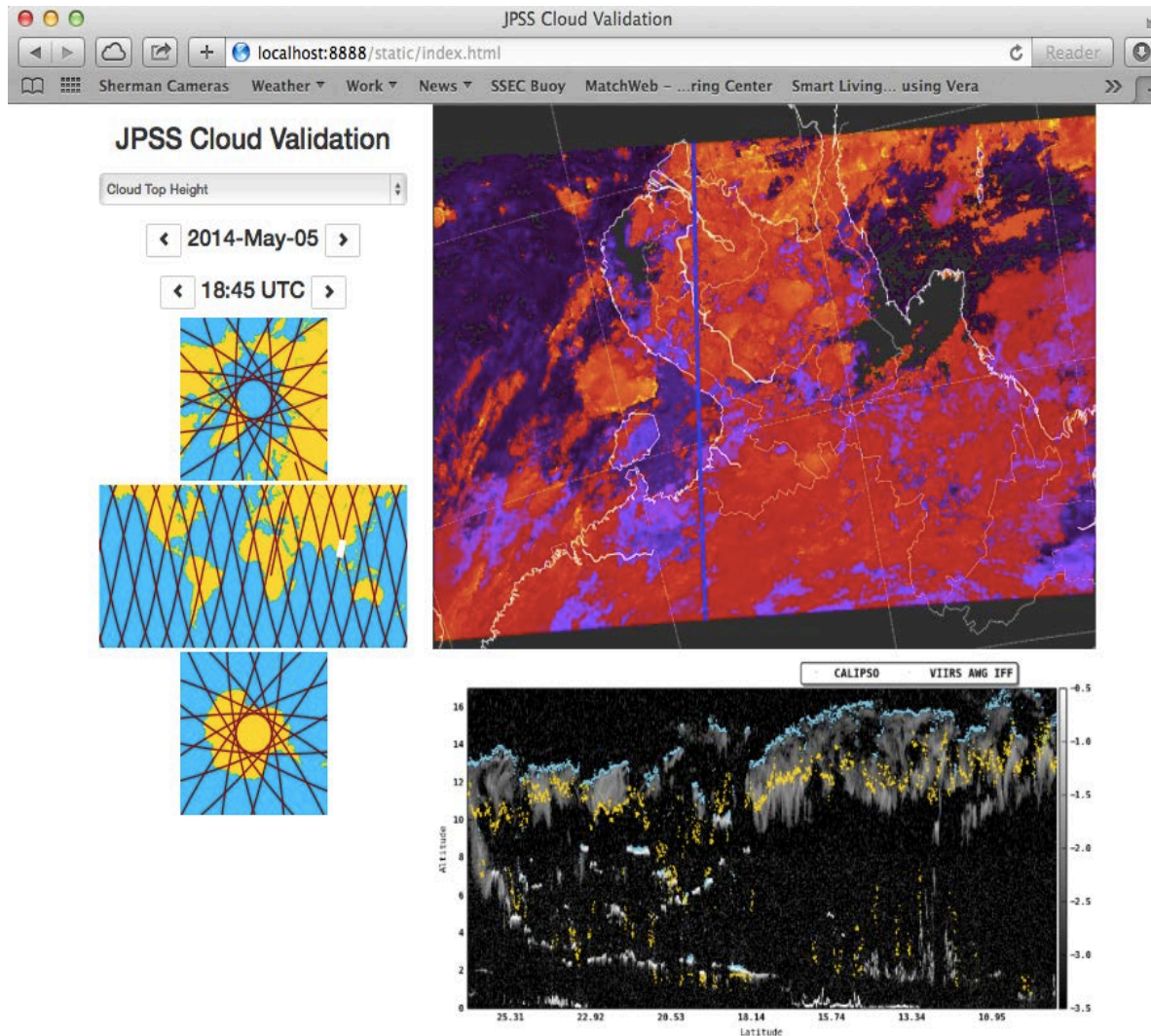


Questions



- For algorithms making the switch to NOAA-endorsed NDE algorithms, what do we do in the time prior to NDE becoming operational? *(It makes little sense to push for Val Stages on algorithms that are being replaced?)*
- Can we reached Val Stage 1 with an NDE algorithm before the NDE SAPF is operational? Can CLAVR-x or CSPP be used for the required testing?
- Is there an option #4, move IDPS algorithm into NDE?

Screenshot of SSEC JPSS Cloud Val Website (Bob Holz)



- The JPSS cloud validation system provides both near real-time and long term validation of the JPSS products
- The system leverages the SSEC collocation and processing infrastructure allowing quantitative inter-comparisons between polar and geo-stationary observations and products
- The results are accessible through a web interface



Thank You

