AOT Retrievals of China Smog Events (Winter 2015-2016) Using Two Different S-NPP VIIRS AOT Products

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Motivations

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S-NPP VIIRS RGB
Outline

1. The Two S-NPP VIIRS AOT Algorithms
   - IDPS: Interface Data Processing Segment
   - EPS: Enterprise Processing System
2. The Missing China Smog Retrievals in IDPS Product
3. The Improved China Smog AOT Retrievals in EPS
4. Characterization of China Smog Events using EPS
5. Summary
EPS extends the AOT reporting range from [0, 2.0] to [-0.05, 5.0];

EPS has AOT retrievals over both dark and bright surfaces;

EPS has an internal heavy aerosol callback that tests heavy aerosol over cloud mask’s water cloud pixels;

IDPS missed AOT retrievals of some heavy China Smog events, how about EPS?
RGB Image [R=M5 (672 nm), G=M4 (555 nm), B=M3 (488 nm)]

VCM Cloud Confidence

IP Snow/Ice

IP AOT Out of Spec Range
Why did IDPS miss the retrievals?

Percentile (%) of Factors Attributed for Not Retrieving Smog AOD

- 51.69% IDPS AOT with QF not produced or excluded
- 18.61% EPS AOT with QF (low, medium or high) > 0.5
More good quality AOT in EPS

EPS almost **doubled** (2.06) the number of good quality AOT retrievals from IDPS

EPS also **doubled** (2.03) the number of good quality AOT>0.5 retrievals from IDPS
AOT Data Distribution

PDF of High Quality EPS AOT > 0.5
Mean AOT: 1.09
Highest: 4.998
Daily AOT Means (means of good quality AOT > 0.5)

Mean AOT: 1.09

High Quality AOT Means

13 Dates

Mean AOT: 1.09
China smog events can be as large as 200,000 km² with AOT>1.0!
VIIRS vs. AERONET

**IDPS: China Smog, 2015 Nov-2016 Feb, M2M, Best QA**

- N=261
- Fit: Y=0.711X+0.101; R=0.780
- Accuracy=0.0205
- Precision=0.167
- Uncertainty=0.168

**EPS: China Smog, 2015 Nov-2016 Feb, M2M, Best QA**

- N=440
- Fit: Y=1.026X+0.036; R=0.902
- Accuracy=0.0446
- Precision=0.172
- Uncertainty=0.178

~70% more of Good Quality matchups
The main reason for the IDPS VIIRS aerosol algorithm missed smog AOT retrievals is the snow test (52%), followed by AOT out of range (19%) and cloud screening (12%);

EPS VIIRS Aerosol Algorithm has much more smog AOT retrievals than IDPS (~70% more);

A large China Smog event can be as large as 200,000 km² with AOT > 1.0;

EPS AOT has much better correlation with AERONET than IDPS;

The EPS VIIRS aerosol algorithm will become operational soon......
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