Improved Deep Blue Aerosol Data Records from SNPP/NOAA-20 VIIRS and Beyond

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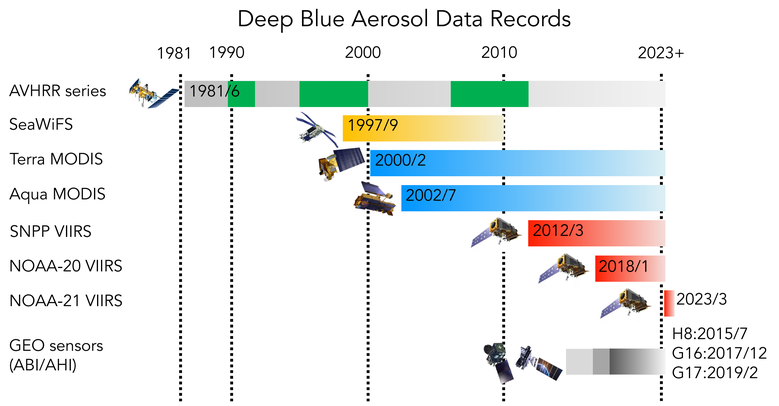
Deep Blue Aerosol Project

- This presentation introduces our latest VIIRS Version 2 Deep Blue aerosol products from SNPP and NOAA-20, which significantly improve upon the previous version.
- New data sets are now available at https://earthdata.nasa.gov
- NASA's Deep Blue aerosol project aims to provide consistent long-term aerosol climate data records from LEO and GEO satellite sensors.
- Primary data product provided is aerosol optical depth (AOD) at 550 nm among other parameters (spectral AOD, Ångström exponent, fine-mode AOD fraction over water, and aerosol type).
- Data covers cloud/snow/ice-free global land and water surfaces (except for MODIS for which only over-land data are available for the time being).



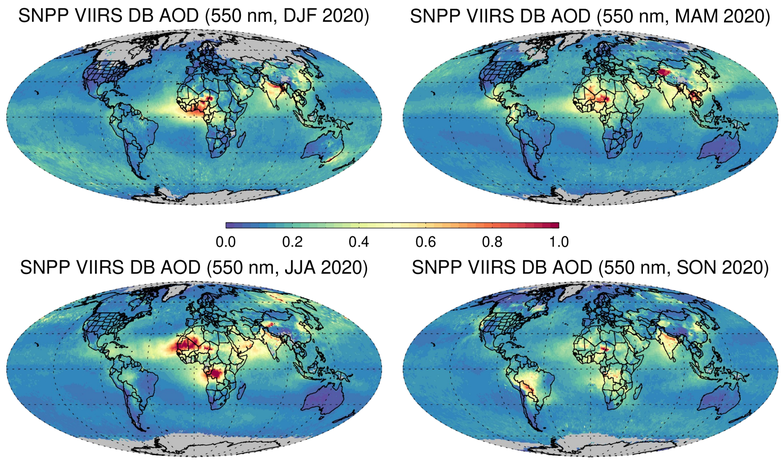
Acronyms

ABI: Advanced Baseline Imager, AERONET: Aerosol Robotic Network, AHI: Advanced Himawari Imager, AVHRR: Advanced Very High Resolution Radiometer, GEO: geostationary orbit, LEO: low Earth orbit, MODIS: Moderate Resolution Imaging Spectroradiometer, SeaWiFS: Sea-viewing Wide Field-of-view Sensor, VIIRS: Visible Infrared Imaging Radiometer Suite

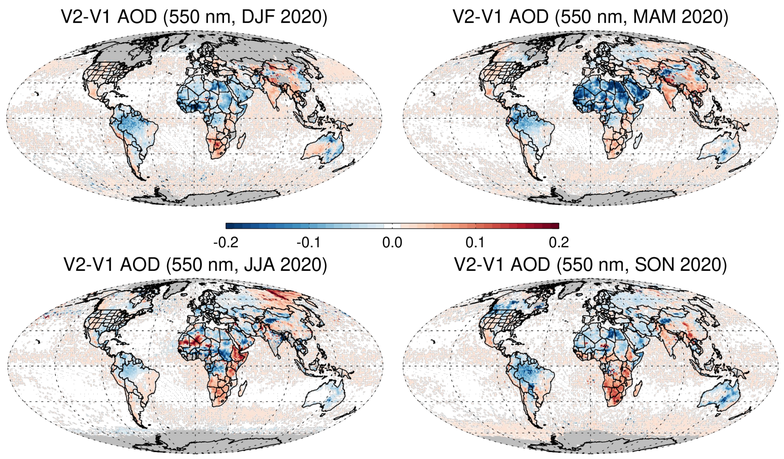
Major Updates

- **Better surface pressure (or elevation) handling**
  - Added surface pressure nodes to the lookup tables to account for the effects of surface pressure/elevation in a physically-based way, as compared to the empirical method used in the previous version.
- **Improved surface reflectance determination**
  - Created new surface database describing inter-wavelength surface reflectance relationships between visible and 2.2 μm bands in each geographic grid.
  - This new method replaces the original surface database used over bright surfaces and is also combined with the original empirical method (regionally derived inter-wavelength surface reflectance method) over vegetated surfaces.
- **New aerosol optical model for anthropogenic aerosols**
  - New fine-mode dominant aerosol optical model replaces the original spherical optical model (as opposed to the nonspherical dust model) for better representation of anthropogenic aerosols.

SNPP VIIRS Version 2 Seasonal Mean AOD

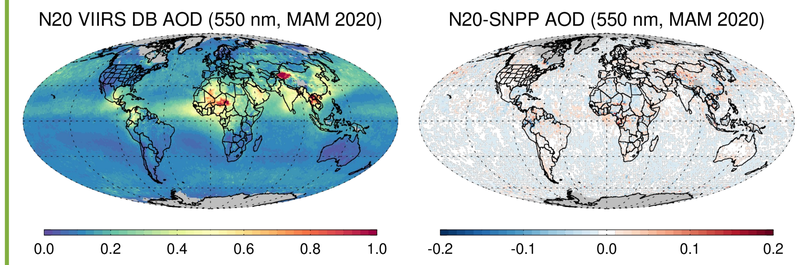


Version 2 vs. Version 1 AOD



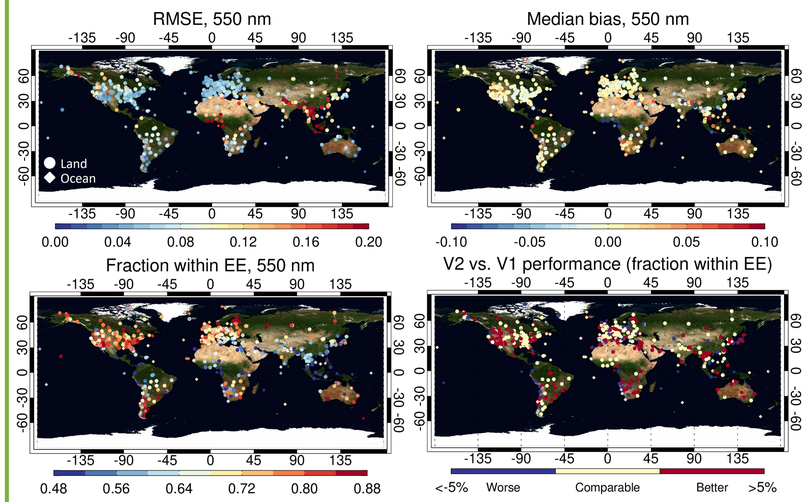
- **Surface pressure**
  - Mitigates negative biases over high elevation regions; Western U.S., Andes mountains, Southern Africa, Western China, Western Australia, etc.
  - Accounts for effects of surface pressure over ocean.
- **Surface reflectance**
  - Improves AOD over bright surfaces and partly over vegetated surfaces; North Africa, Australia, part of high elevation regions, etc.
- **Aerosol optical model**
  - Aerosol optical models were updated particularly for biomass burning smoke over South America and Southern Africa, mineral dust over North Africa and other deserts, and anthropogenic aerosols in general.
- Other updates include revised smoke/cloud detection, bugfix in counting bow-tie deletion pixels (general increase in data coverage over ocean), etc.

NOAA-20 vs. SNPP VIIRS AOD



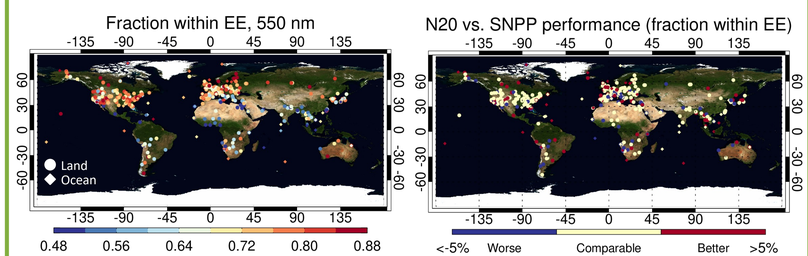
- N20 VIIRS shows comparable performance to SNPP after cross-calibrated to SNPP using collocated data over Dome C site (Aqua MODIS serves as a bridge between the two VIIRS sensors; N20 leads SNPP by ~50 minutes).
- Mean offset = 0.001 – 0.005 over land, (-0.006) – (-0.009) over ocean, and (-0.004) – (-0.006) overall, depending on season

AOD Validation against AERONET (SNPP, 2012-2020)



Estimated error (EE) = ±(0.03+15%) over land, ±(0.03+10%) over ocean

For NOAA-20 VIIRS AOD (2018-2020)



Acknowledgements

This project is funded by NASA's SNPPSP Program. A-SIPS and AERONET teams are thanked for maintaining/distributing the data used in this study.