

New AVHRR, MODIS, and VIIRS aerosol products from Deep Blue

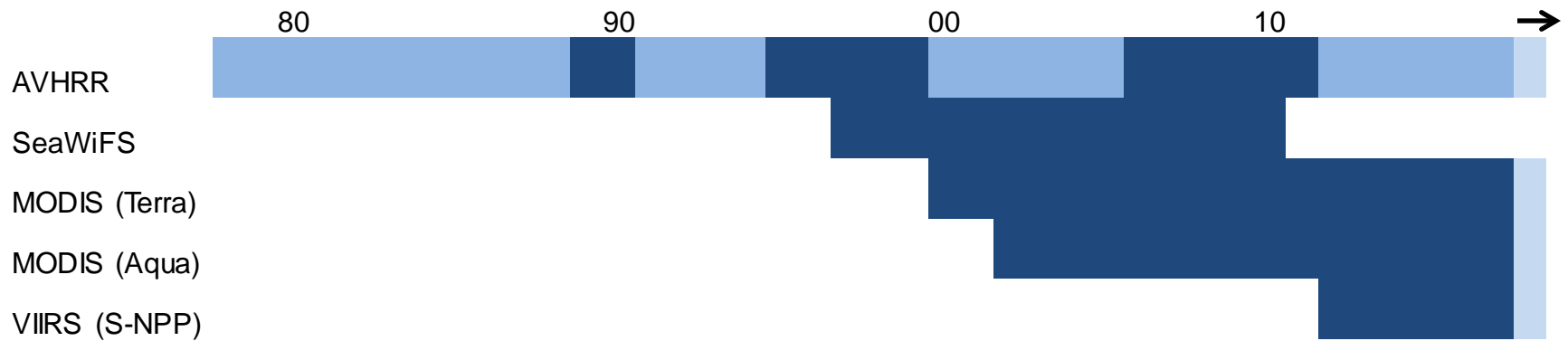
Andrew Sayer
GESTAR-USRA at NASA GSFC
andrew.sayer@nasa.gov

N. C. Hsu (Project PI), J. Lee, W. V. Kim

<https://deepblue.gsfc.nasa.gov/>



Using multiple similar satellite sensors we move towards a consistent long-term record



<https://deepblue.gsfc.nasa.gov/>



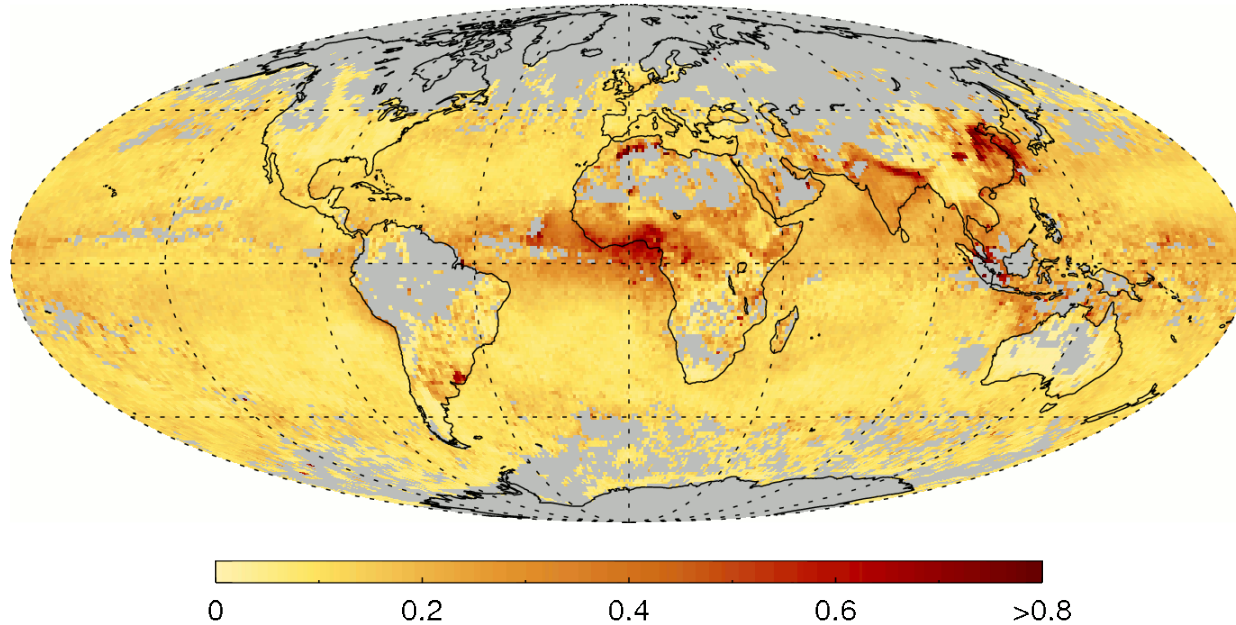
AVHRR

MODIS Collection 6.1

VIIRS

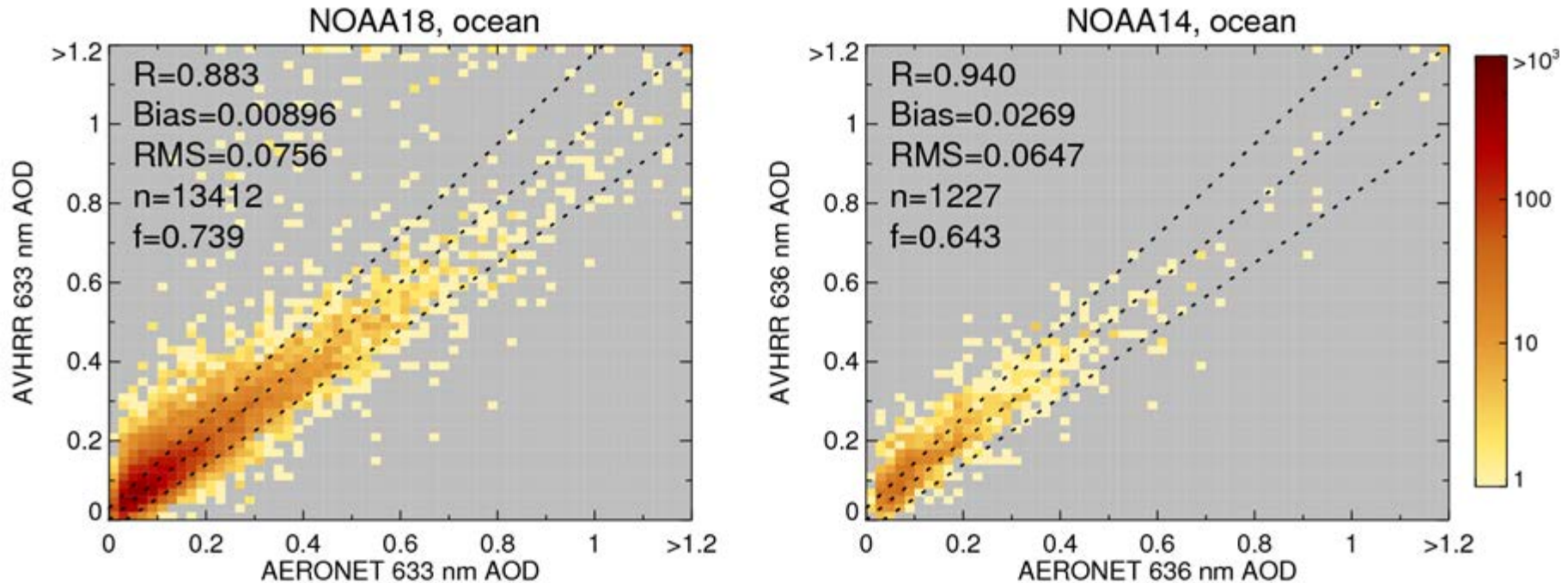
AVHRR Deep Blue: a proof of concept for AVHRR AOD retrieval over land

NOAA18 AVHRR Deep Blue 550 nm AOD, 200601



Currently **NOAA11** (1989-1991), **NOAA14** (1995-1999), **NOAA18** (2006-2011)
AOD at 550 nm and AVHRR band 1 (~630 nm) over land and ocean
Level 2 data in 5-minute granules, ~8.8x8.8 km² pixel size at the sub-satellite point
Level 3 daily and monthly composites at 1° horizontal resolution
NetCDF4 format, CF version 1.6 metadata conventions

Error characteristics are broadly similar between the different AVHRR sensors

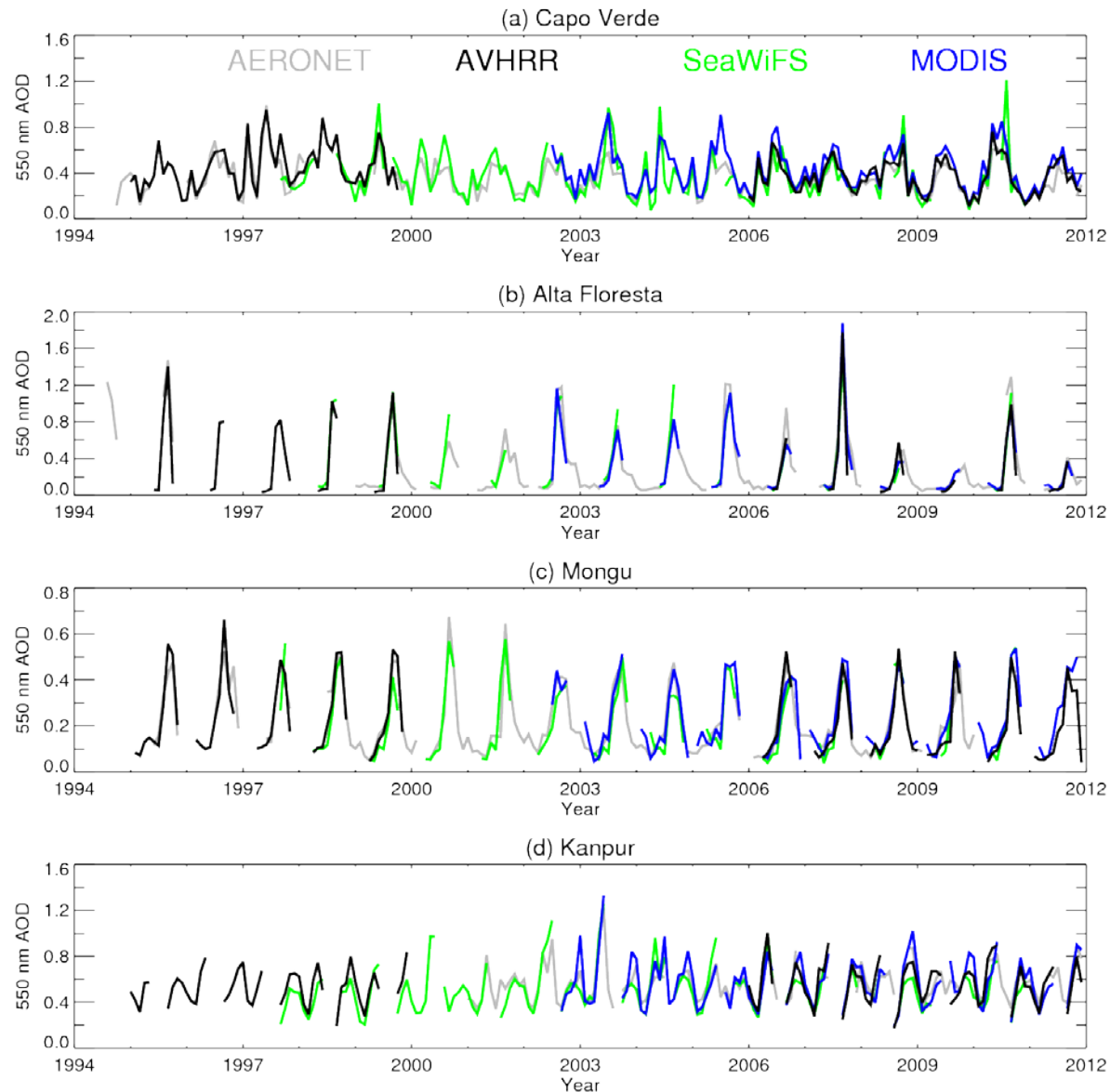


Expected error envelopes 0.03+15% over water, 0.05+25% over land

Also examined errors vs. aerosol type, region

Very limited validation available before mid-1990s (pre-AERONET)

We can examine inter-sensor consistency and think about combining data records



AVHRR

MODIS Collection 6.1

VIIRS

The C6.1 reprocessing has begun!

Collection 6.1 (061) Release Schedule

MODIS Level-1 and MODIS Atmosphere Level-2 & Level-3

MODIS Platform & Stream	Production Public Release Date (for any part of stream)	Production Completion Date (for entire stream)	Data Dates (start to end)
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Terra and Aqua Forward Processing Streams

Terra Forward	15 Oct 2017	15 Oct 2017	1 Sep 2017 and forward
Aqua Forward	15 Oct 2017	15 Oct 2017	1 Sep 2017 and forward

Terra Historical or Reprocessing Stream

Terra Historical	1 Nov 2017	1 Feb 2018	25 Feb 2000 (Terra 1 st Day) to 31 Aug 2017
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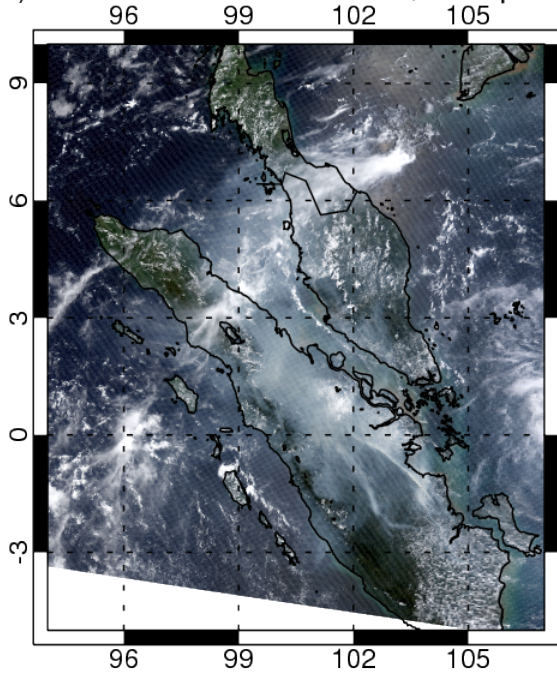
Aqua Historical or Reprocessing Stream

Aqua Historical	1 Feb 2018	1 Jun 2018	25 Jun 2002 (Aqua 1 st Day) to 31 Aug 2017
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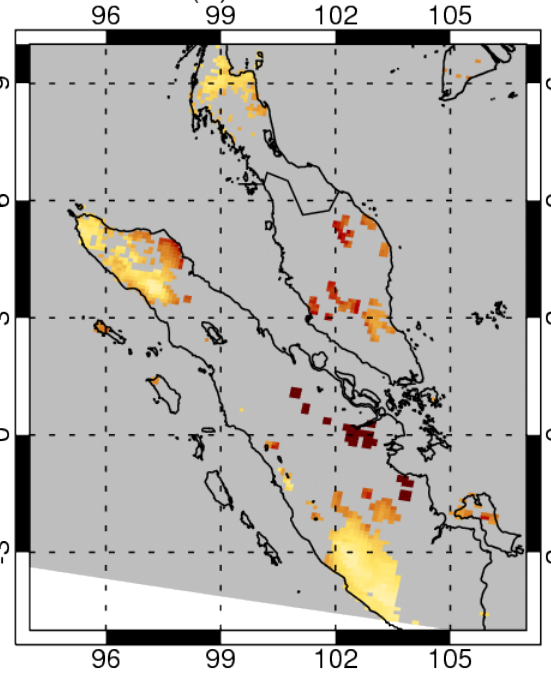
Nominal processing is 50x corresponding to 4 years of MODIS L1B & ATM data for a single platform processed in 1 calendar month

Improved cloud/smoke discrimination: less overscreening in complex environments

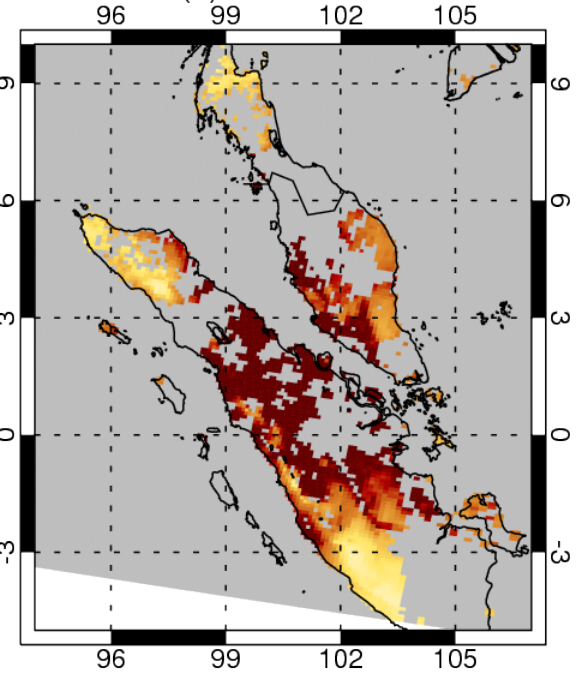
(a) MODIS Terra 0350 UTC, 2 Sep 2015



(b) C6 AOD

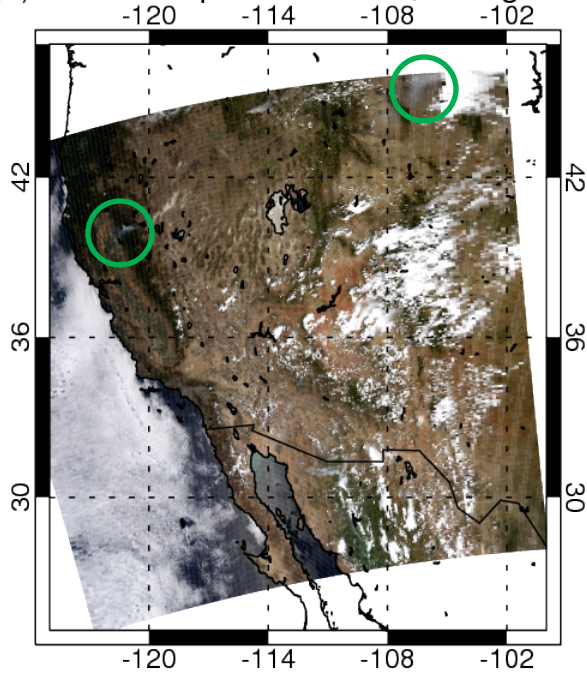


(c) C6.1 AOD

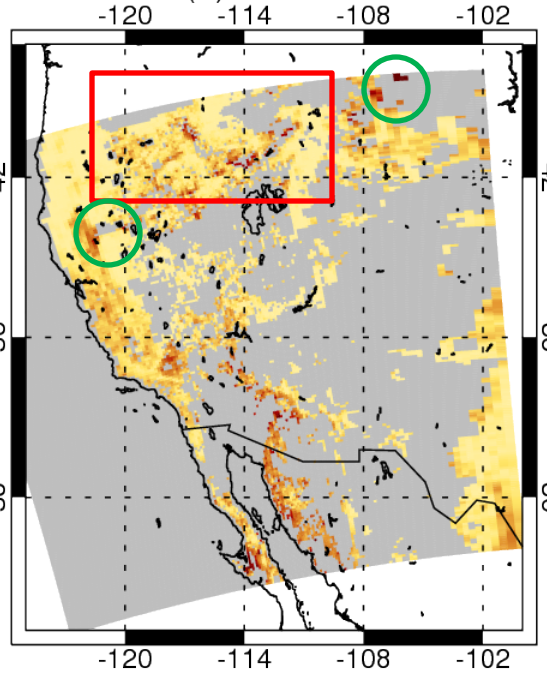


Suppressed surface artefacts and improved plume detection in rugged terrain

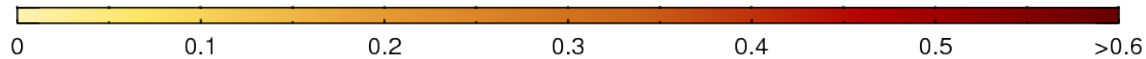
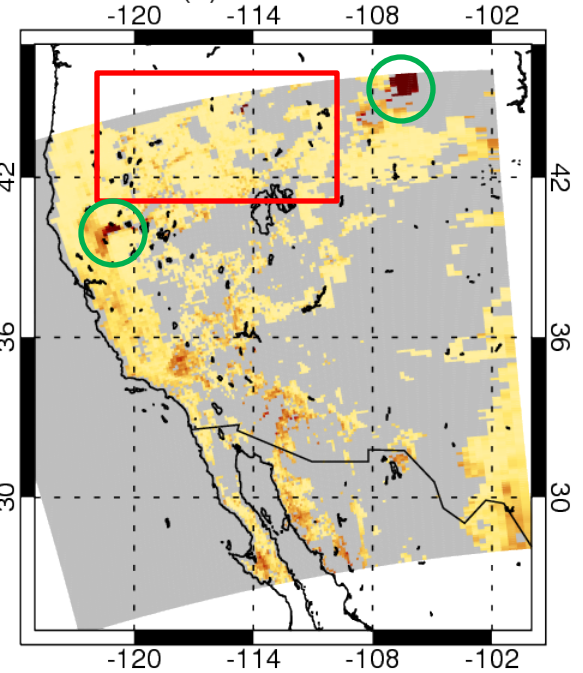
(a) MODIS Aqua 2045 UTC, 2 Aug 2012



(b) C6 AOD

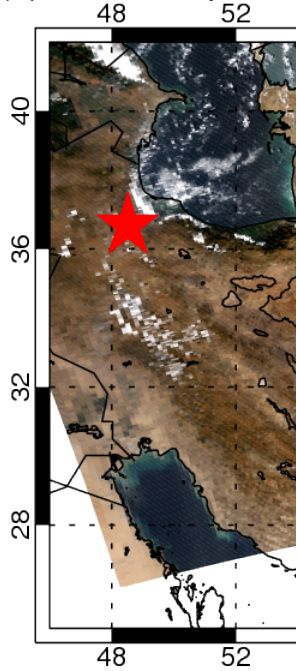


(c) C6.1 AOD

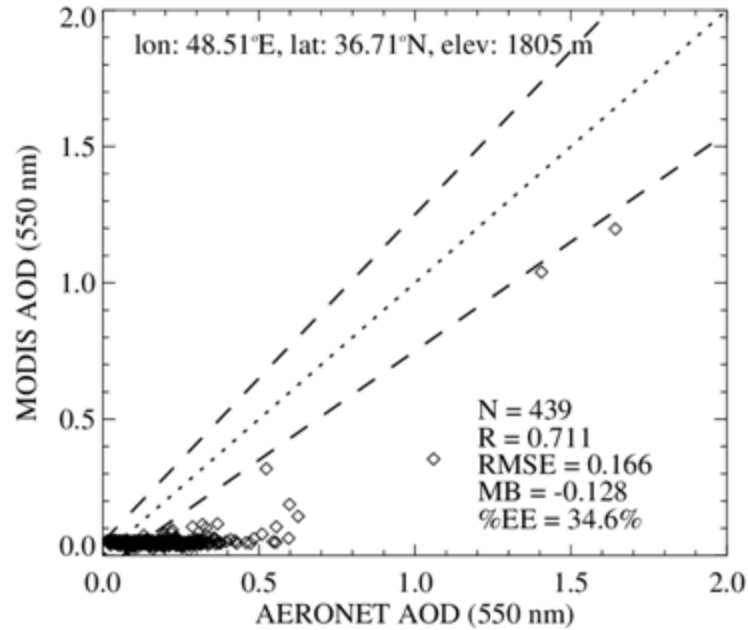


A frequent low bias in AOD over mountains has been addressed

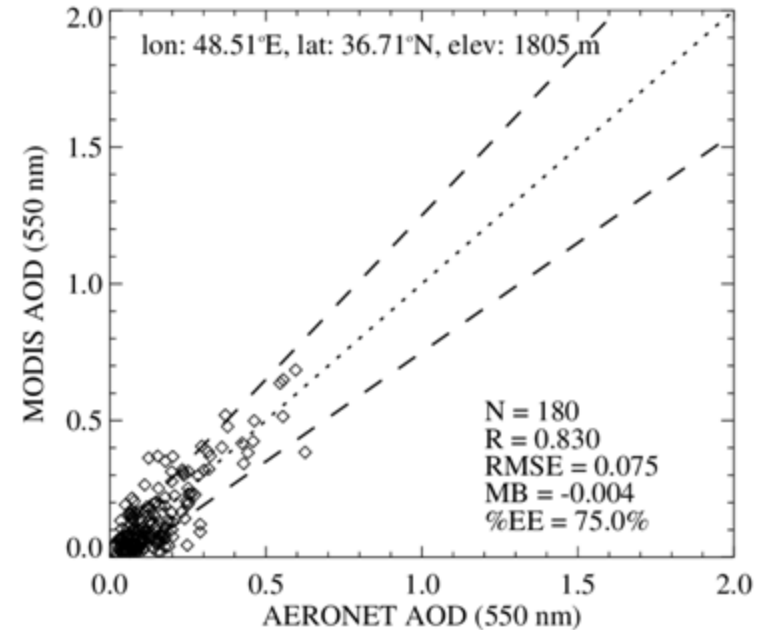
(a) MODIS Aqua 09



Collection 6: IASBS



Collection 6.1: IASBS



Other updates for C6.1 include...

Calibration updates for both sensors

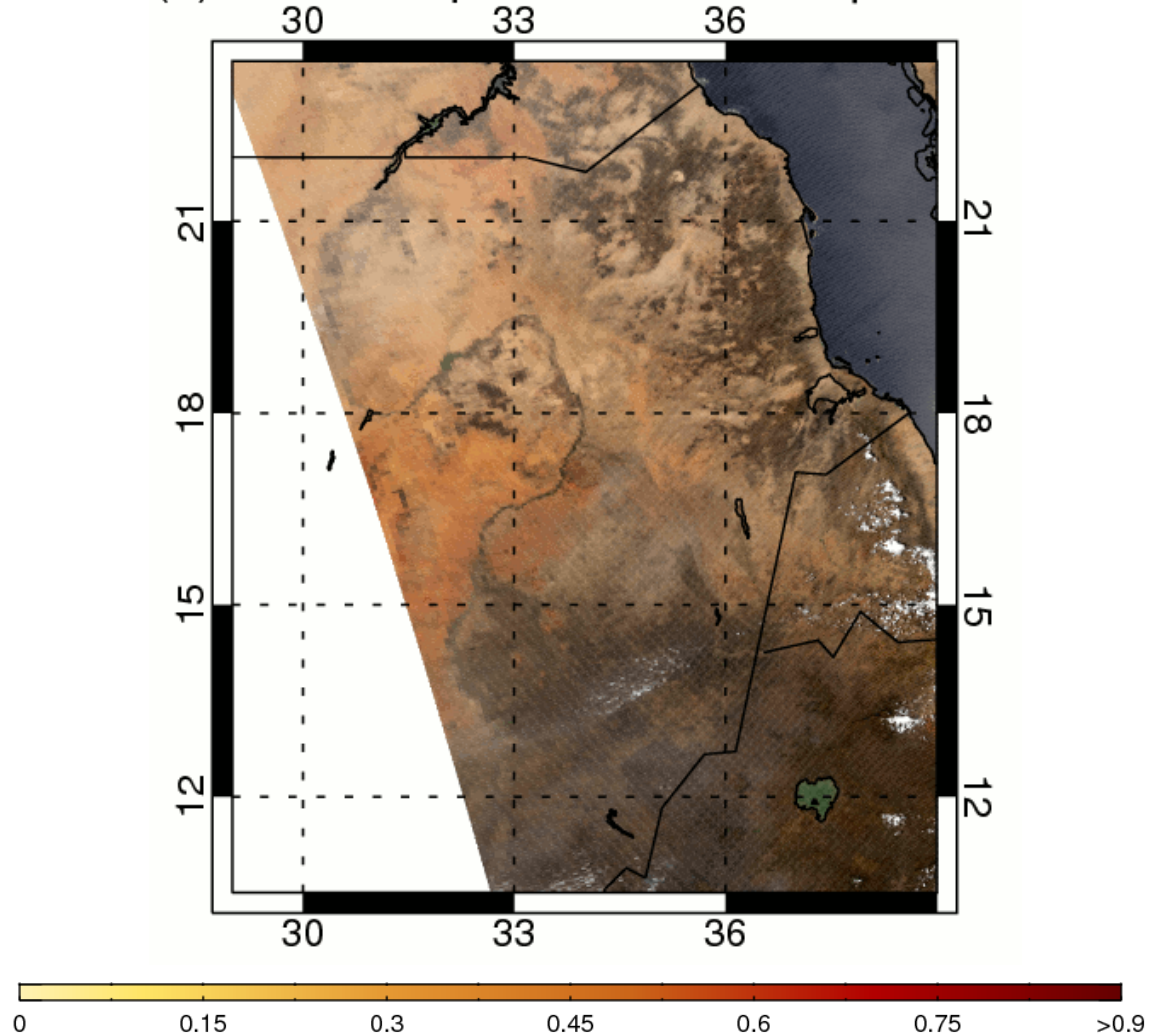
Thermal crosstalk fix for Terra

Retrieval-level AOD uncertainty estimates now split by surface type

Regional adjustments to aerosol optical models

Attribute/metadata updates

(a) MODIS Aqua 1035 UTC, 9 Apr 2016



AVHRR

MODIS Collection 6.1

VIIRS

VIIRS Deep Blue extends and improves upon MODIS heritage products

Horizontal pixel size
6 km at nadir

Reduced bowtie
distortion compared
to MODIS

Pixel-level quality
assurance (QA) flags

Level 2 (swath) and 3
(daily/monthly) data
products

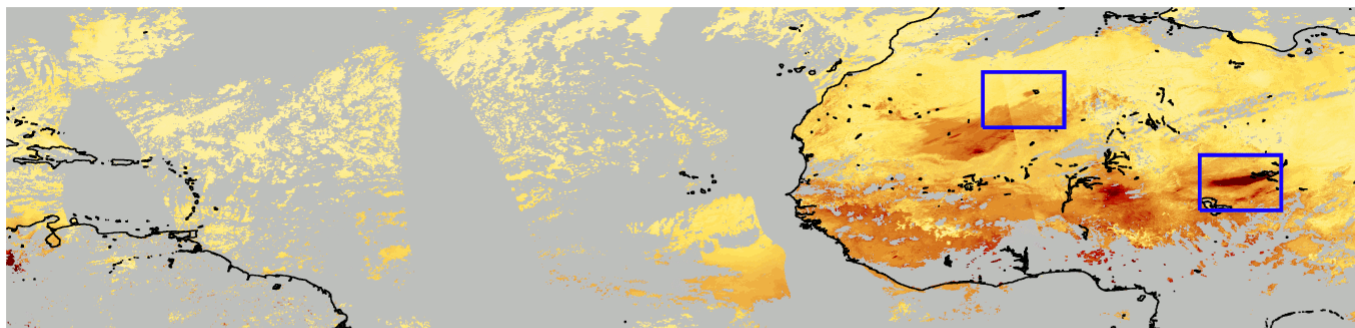
Full (re)processing(s)
with **consistent**
algorithm and
calibration

Validation results
similar to/better than
SeaWiFS, MODIS

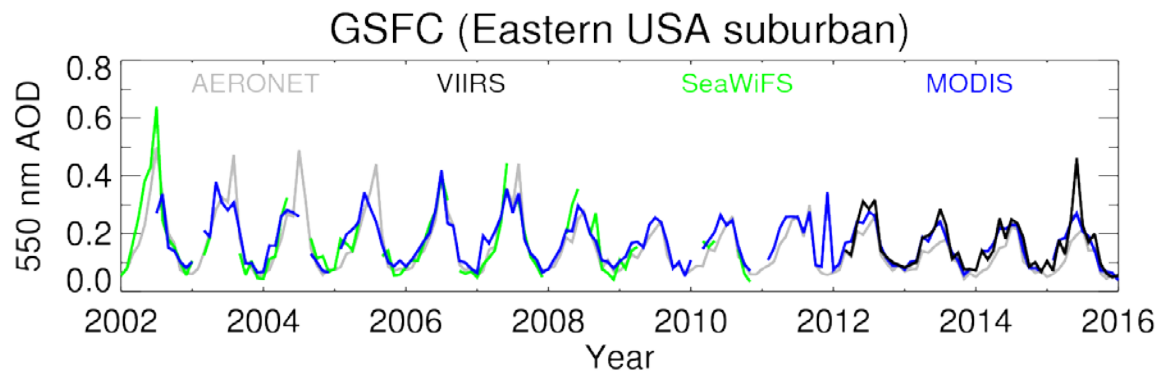
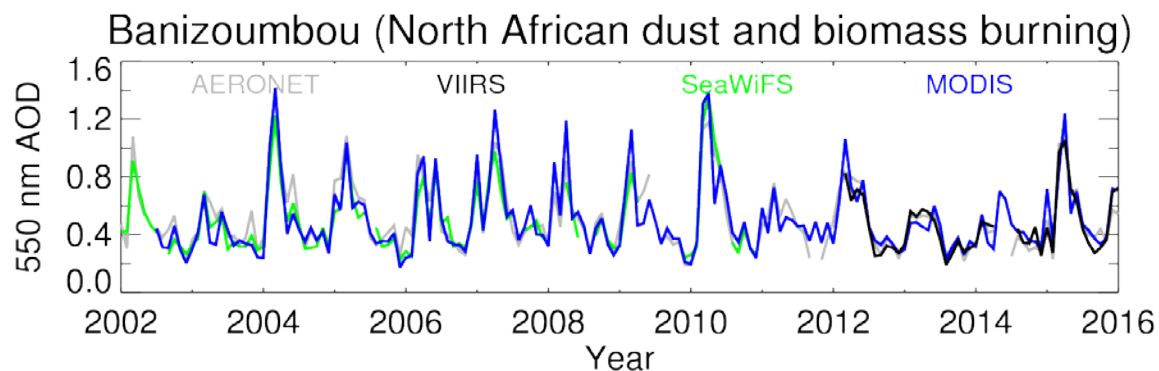
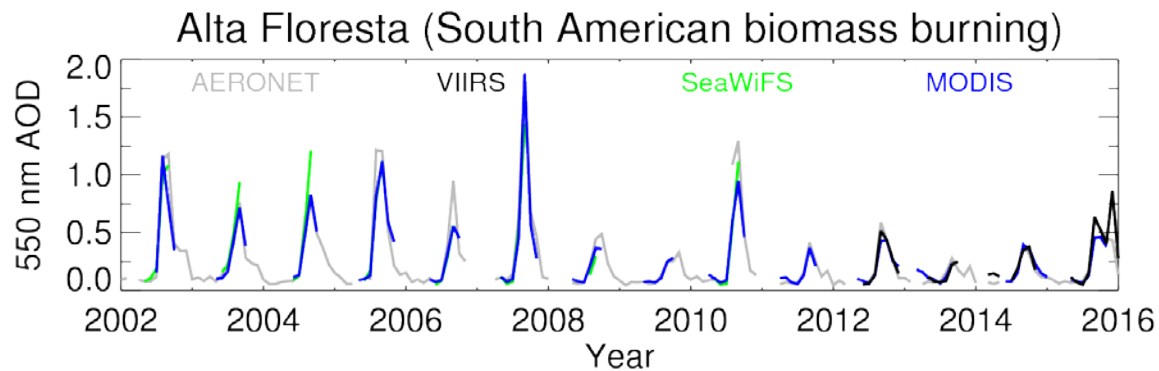
VIIRS imagery, 20140226



VIIRS Deep Blue aerosol loading (AOD at 550 nm)



Although VIIRS and MODIS are different sensors, VIIRS should be able to continue the EOS-era record



Summary

- The Deep Blue project provides **freely-available** aerosol data from:
- 2 years N11, 5 years N14, 6 years N18 **AVHRR** (demonstration)
 - Hsu *et al.* (2017), *J. Geophys. Res.*, doi:10.1002/2017JD026932
 - Sayer *et al.* (2017), *J. Geophys. Res.*, doi:10.1002/2017JD026934
 - 13 years **SeaWiFS**
 - 17+ years Terra, 15+ years Aqua **MODIS** (C6.1 underway)
 - 5+ years S-NPP **VIIRS** (coming soon)
 - Sayer *et al.* (2017), *Atmos. Meas. Tech.*, doi:amt-10-1425-2017

Taking a **consistent approach** as much as possible between sensors helps us to move towards the goal of a long-term climate data record

Each data set is **validated** and is (or will soon be) published in peer-reviewed journals

For news, documentation, links, and more, visit
<https://deepblue.gsfc.nasa.gov>