GOES-16 Advanced Baseline Imager (ABI) Fire Detection and Characterization (FDC)

Ivan Csiszar, Wilfrid Schroeder NOAA/NESDIS

Christopher Schmidt

Cooperative Institute for Meteorological Satellite Studies, University of Wisconsin

Additional contribution: Shobha Kondragunta (NOAA/NESDIS)



GOES-16 Fire Detection and Characterization Algorithm

- Geostationary fire detection and characterization has been available 24/7 since 2002 when the Wildfire Automated Biomass Burning Algorithm (WFABBA) was made an operational product by NOAA/NESDIS
- The WFABBA produces fire location and characterization data for all data received from current GOES, Meteosat Second Generation, COMS, the formerly operational MTSAT series, and the Advanced Himawari Imager (AHI) on Himawari-8
- The experience with current generation geostationary platforms informed the requirements for the Advanced Baseline Imager (ABI) on GOES-R, and the WFABBA was adapted to the instrument and is a baseline product (under the name Fire Detection and Characterization Algorithm [FDCA])
- The WFABBA's legacy as an algorithm for multiple instruments allows for excellent continuity as we transition to the new generation of geostationary imagers represented by ABI and AHI

GOES-16/ABI vs GOES/Imager

COMPARISON GOES-R SERIES ABI VS CURRENT GOES

ATTRIBUTE :	ABI	CURRENT GOES IMAGER
Spectral Coverage	16 bands	5 bands
Spatial Resolution		
0.64 µm Visible	0.5 km	~ 1 km
Other visible/near-IR	1.0 km	n/a
Bands (>2 µm)	2 km	~ 4 km
Spatial Coverage		
Full Disk	4 per hour	Scheduled (3
CONUS	12 per hour	hrly)
Mesoscale	30 or 60 sec	~4 per hour
		n/a
Visible (reflective bands)		

GOES-16/ABI channel 7 (3.9 µm) saturation temperature: +400K

Will move to its final orbit of 75.2°W in December/2017 replacing GOES-13 as the operational GOES/East satellite

On-orbit calibration Yes

No

GOES-16 vs GOES-13

GOES-16 has higher fidelity, higher spatial resolution, and higher temporal resolution



http://cimss.ssec.wisc.edu/goes/blog/archives/23732

Using the Fire Detection and Characterization L2 Product

Band 7 (enhanced) is on the right, total FRP for the area in the green square (the Chetco-Bar Fire) for the same time period is below. Despite dropped frames and other quirks the FRP data tracks our expectations pretty well. Red frames represent missing L1b radiance data in this region of the scan.

FRP has not been validated for ABI, expected for 2018. Use it with caution, even when fully validated FRP from GOES-16 will, due to diffraction, have substantial error bars on any given measurement. Trends will tend to be more useful than single measurements.







FDCA data availability

- Level-2 FDCA currently a "beta" product "The product is minimally validated and may still contain significant errors; based on product quick looks using the initial calibration parameters"
- Provisional status review expected for March/2018 *"The product performance has been demonstrated through a large, but still (seasonally or otherwise) limited, number of independent measurements. The analysis is sufficient for limited qualitative determinations of product fitness-for-purpose, and the product is potentially ready for testing operational use"*
- Currently will be produced from the Ground System (GS) for Full Disk (FD) and CONUS sectors
- It will **not** be produced by the GS for MESO sectors

Data Validation – Beta Status

Landsat-8 Reference Data Acquired During 04-15 March Matching ABI Fire Data to within 5-min



Commission Error Rate (450 false positives out of 514 fire pixels sampled)

Colors indicate ABI pixel class



Commission Error Rate



GOES-16/ABI x EOS/MODIS Fire Data Comparison



GOES-16/ABI x EOS/MODIS Fire Data Comparison



GOES-16/ABI Full disk 2 km resolution 15-min frequency Active fire product (mask) 15 Oct 2017 (Julian day 288)

Main artifacts observed:

- Data dropouts
- Bands of spurious fires around glint areas

Summary

- GOES-16/ABI data have great potential
- Incremental product improvements to be expected
 - Problems with fire algorithm and ground system being investigated
 - Data aggregation scheme could impact quality of FRP retrievals
- Fire data being incorporated into key end user applications for testing and evaluation

GOES-R Fire/Hot Spot Characterization information: <u>http://www.goes-r.gov/products/baseline-fire-hot-spot.html</u>

Hazard Mapping System

- Multi-sensor integrated system
- Integration of GOES-16 data in progress
- Continuous monitoring of product quality
- Providing feedback supporting algorithm refinement



NOAA NESDIS Office of Satellite and Product Operations (OSPO)

http://www.ssd.noaa.gov/PS/FIRE/Layers/VIIRS/viirs.html http://www.ospo.noaa.gov/Products/land/hms.html

Examples of real-time fire and smoke monitoring systems using VIIRS active fire data

HRRR: High Resolution Rapid Refresh



HRRR-SMOKE 2017-10-09 18 UTC 36h fcst eXPERIMENTAL Valid 10/11/2017 06:00 UTC (Vertically Integrated Smoke (mg/m²))



https://rapidrefresh.noaa.gov/hrrr/HRRRsmoke/

Inclusion of GOES-16 ABI data is ongoing

eIDEA: enhanced Infusing satellite Data into Environmental Applications



https://www.star.nesdis.noaa.gov/smcd/spb/aq/eidea/ https://www.star.nesdis.noaa.gov/smcd/spb/aq/eidea-ak/

Example of real-time fire and smoke monitoring systems using ABI active fire data



System in development. AOD, Smoke Dust mask and Fire are beta products, which have not been fully validated, and therefore are not recommended for scientific use.

OES-16 is temporarily located at 89°W now. It will move to the final position at 75°W in Nov. 2017 AOO, Smoke Dust mask and Fire are beta products, which have not been fully validated, and therefore are not ecommended for scientific use Destroyed and the product of the product Disclaments information of unality. I Access Billion Customer Survey