# Development of a harmonized multi-sensor global active fire data set

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# Motivation

- First geostationary satellite active fire detection product was proposed in the late 80s (E. Prins – Univ. Wisconsin)
    - Automated Biomass Burning Algorithm (ABBA) using the Geostationary Operational Environmental Satellite Visible infrared spin scan radiometer Atmospheric Sounder (VAS) 13.8 km resolution (mid-IR)

- A revised ABBA algorithm version (WF-ABBA) was implemented for subsequent GOES East/West Imager 4-km (mid-IR) data (GOES 8-15) (e.g., Prins et al, 1998)

- Similar fire algorithms proposed/implemented for EUMETSAT's Spinning Enhanced Visible and InfraRed Imager (SEVIRI) 3-km (mid-IR) data (Roberts et al., 2005)

- Positioning of secondary MSG/SEVIRI over Indian Ocean, and launch of next generation sensors (Himawari-8/AHI and GOES-16/ABI 2-km (mid-IR) data) enabling quality global geostationary fire data network to form

- *"Ultimately, the best value added fire products will be made by a combination of polar and geostationary satellite systems"* [GOFC/GOLD, 2006]

# Existing Geostationary Sensor Network
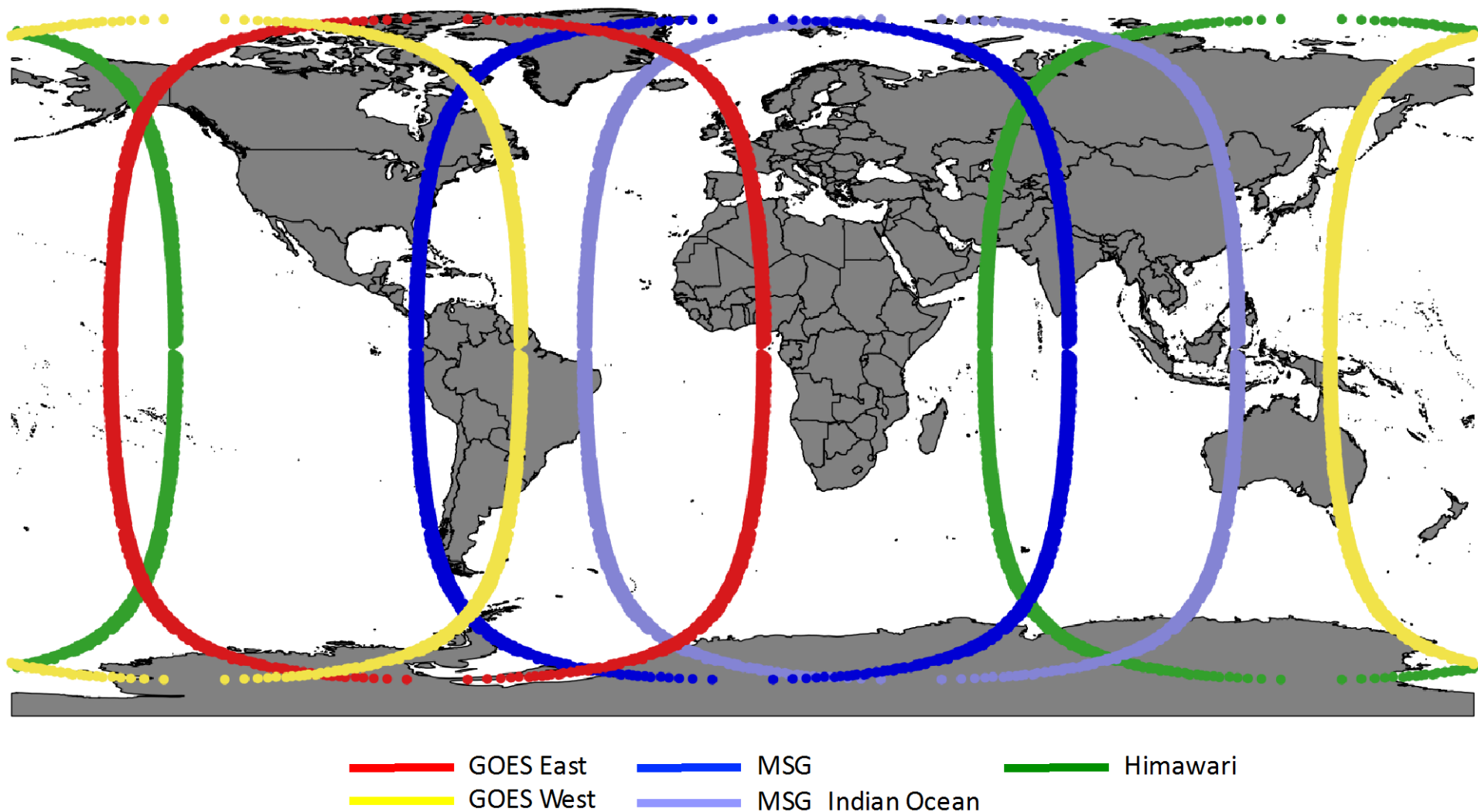
# GWIS Data Viewer
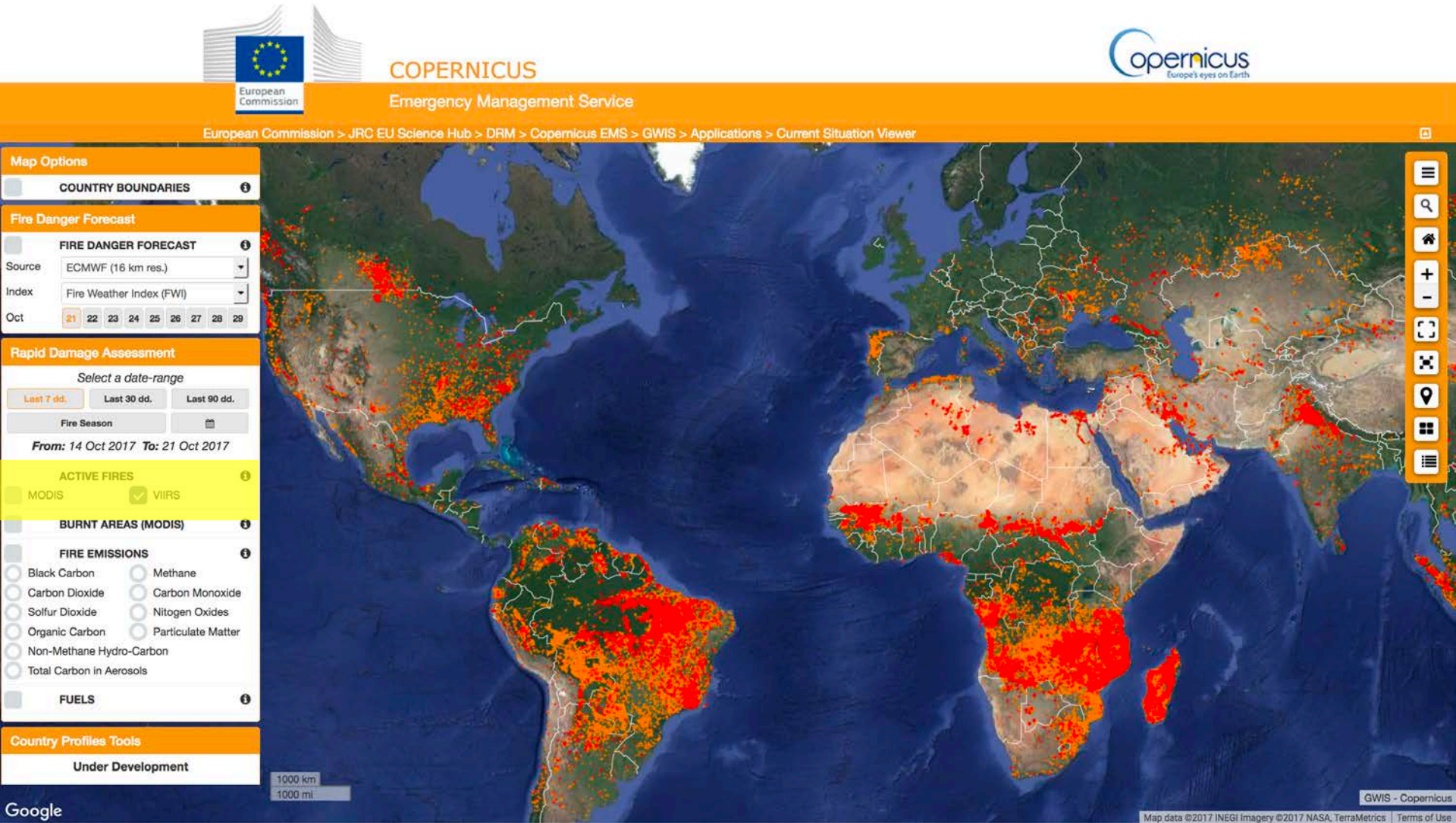
# Main Goals

- (i) Augment existing GWIS fire mapping capabilities with the delivery of a harmonized global multi-sensor fire data set
  - Incorporate geostationary fire data sets following comprehensive data validation/quality assessment

- (ii) Propose and demonstrate fire data analyses tools and use those to generate metrics describing fire activity across regions
  - Promote GIS-friendly fire data format
  - Incorporate essential science data layers (e.g., FRP, cloud cover, block-out zones) supporting robust regional fire assessment

- (iii) Educate users on product characteristics and potential applications
  - Promote regional workshops

# Overall Data Considerations

- Geostationary fire data validation, error assessment remains limited
  - Project will build on EOS/MODIS fire data validation methodology and ongoing GOES-16 fire product validation activities
    - Using standardized reference data derived from Landsat-8/OLI and Sentinel-2/MSI global imagery to assess sub-pixel fire activity
    - Leveraging/customizing data co-location/analyses tools
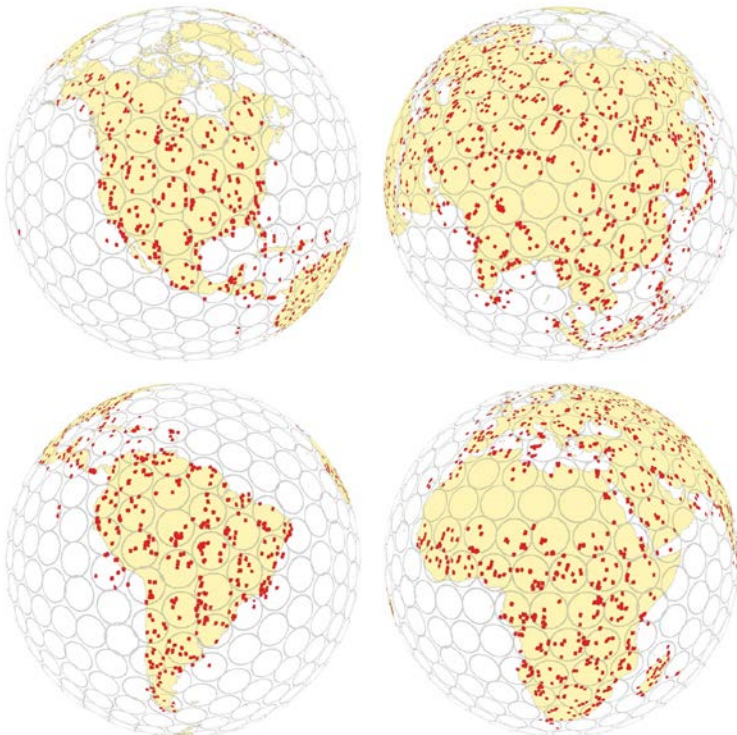


**MODIS C6 fire product global validation using coincident ASTER data**
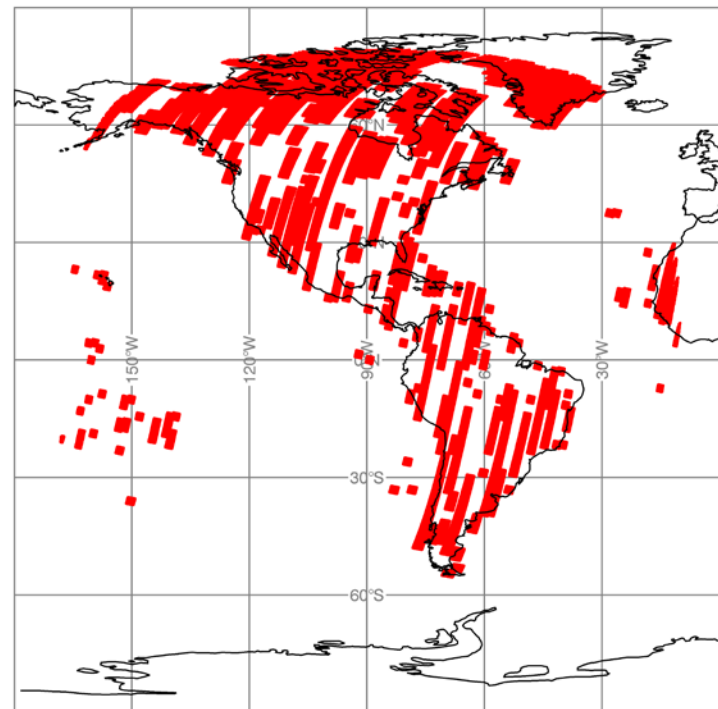


**GOES-16/ABI fire product Beta status validation using near-coincident Landsat-8 data**

# Data Harmonization & Analyses Tools

- Main objective is to reconcile existing products, addressing differences in methodology and leveraging algorithm development efforts
  - Focus on WF-ABBA and FRP-PIXEL fire algorithms
    - Both algorithms have been implemented across main geostationary data sets
  - Promote algorithm comparison/exchange and learn from experience

- Data set attributes shall be incorporated into GIS-friendly content
  - Example: coverage information such as pixel footprints, sun glint blockout zones, latitudinal bias

- Support the development of geostationary-specific fire metrics (e.g., tracking diurnal cycle activity)
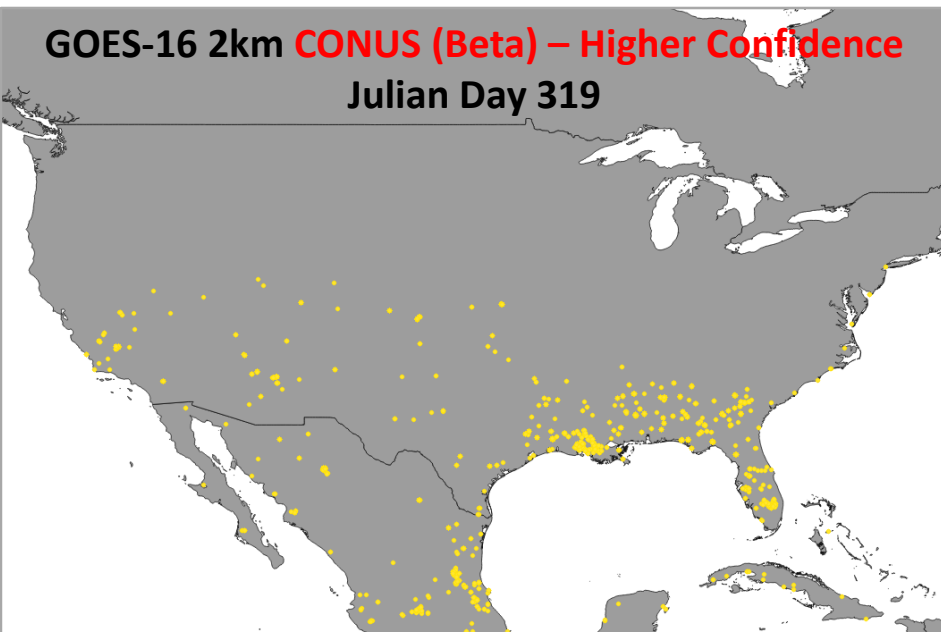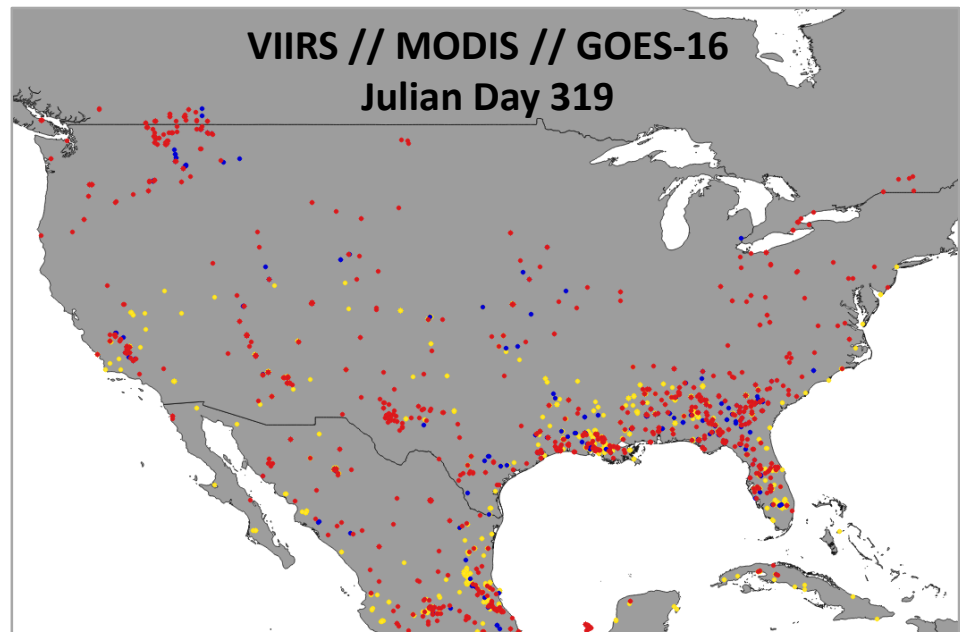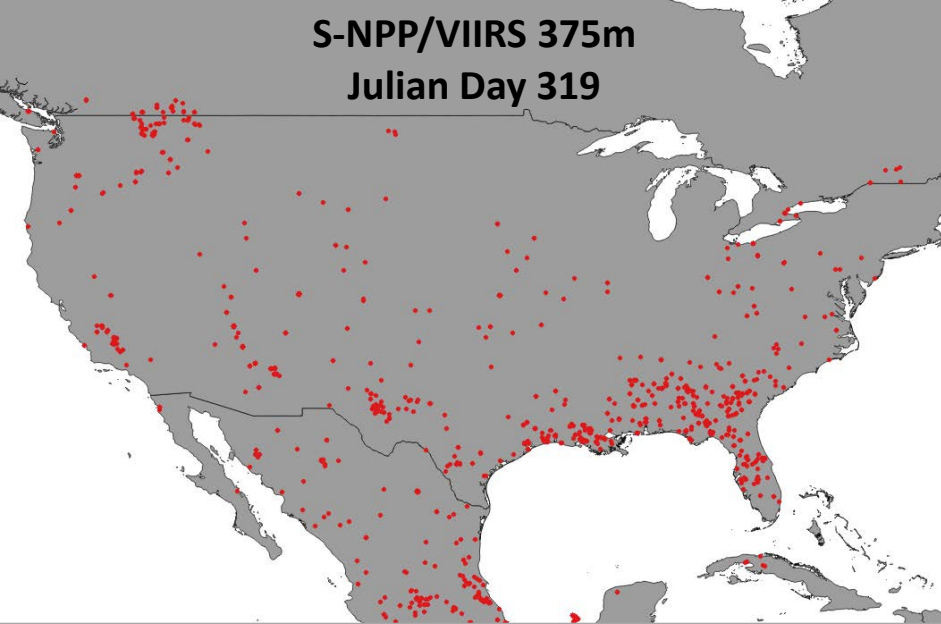
**S-NPP/VIIRS 375m**
**Julian Day 319**
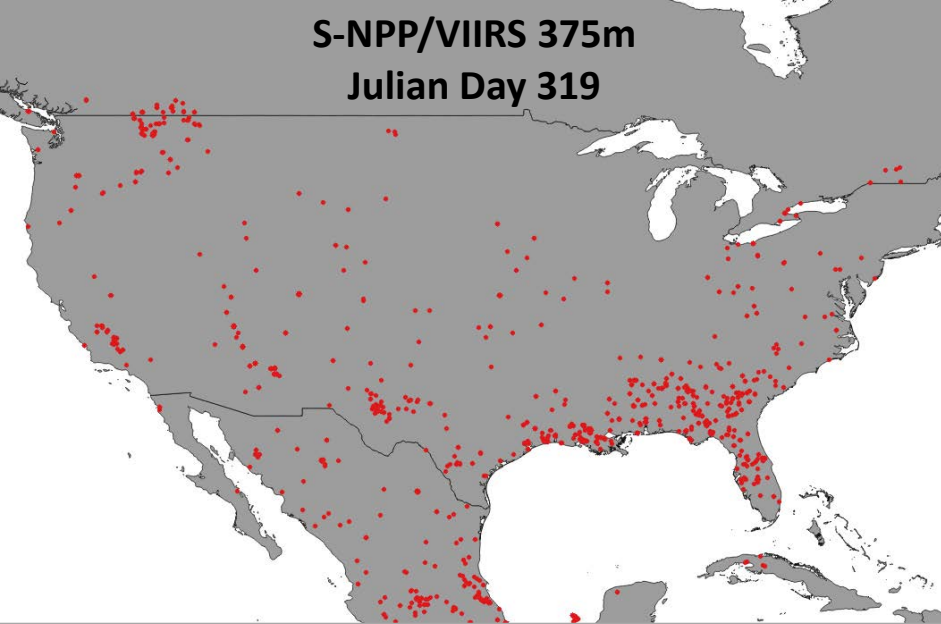
**EOS/MODIS 1km**
**Julian Day 319**
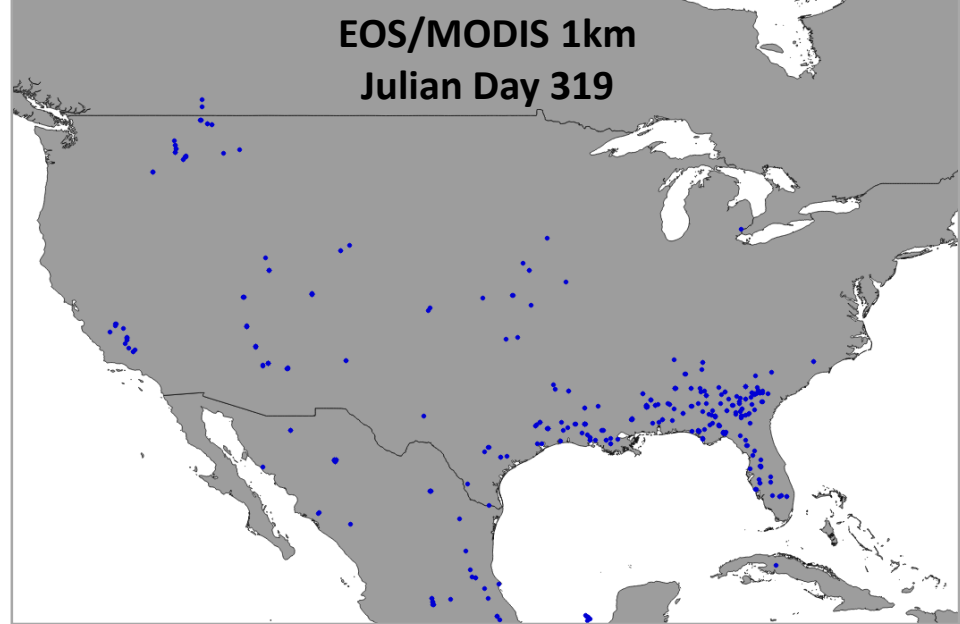
**GOES-16 2km CONUS (Beta) – Higher Confidence**
**Julian Day 319**

**VIIRS // MODIS // GOES-16**
**Julian Day 319**
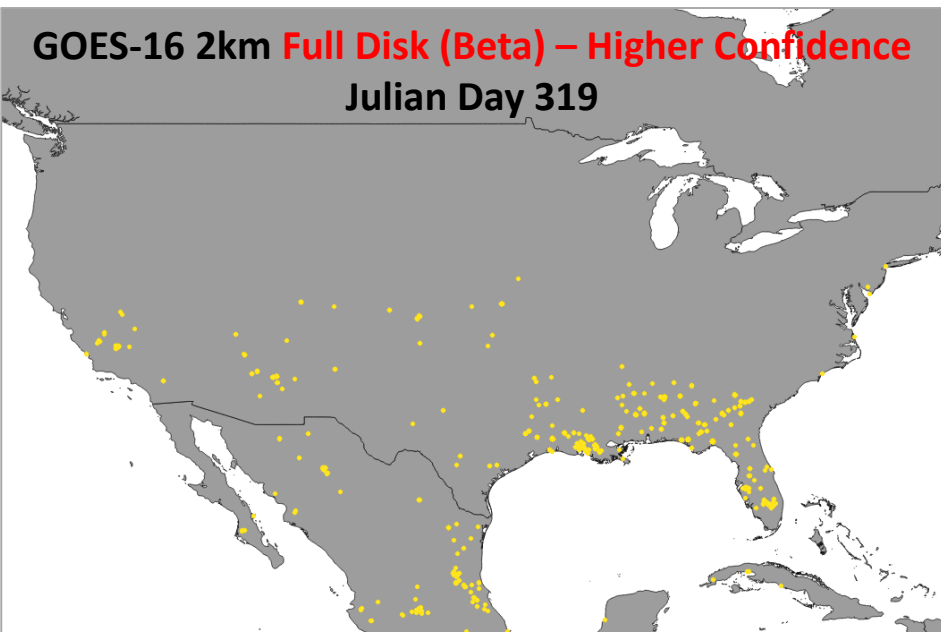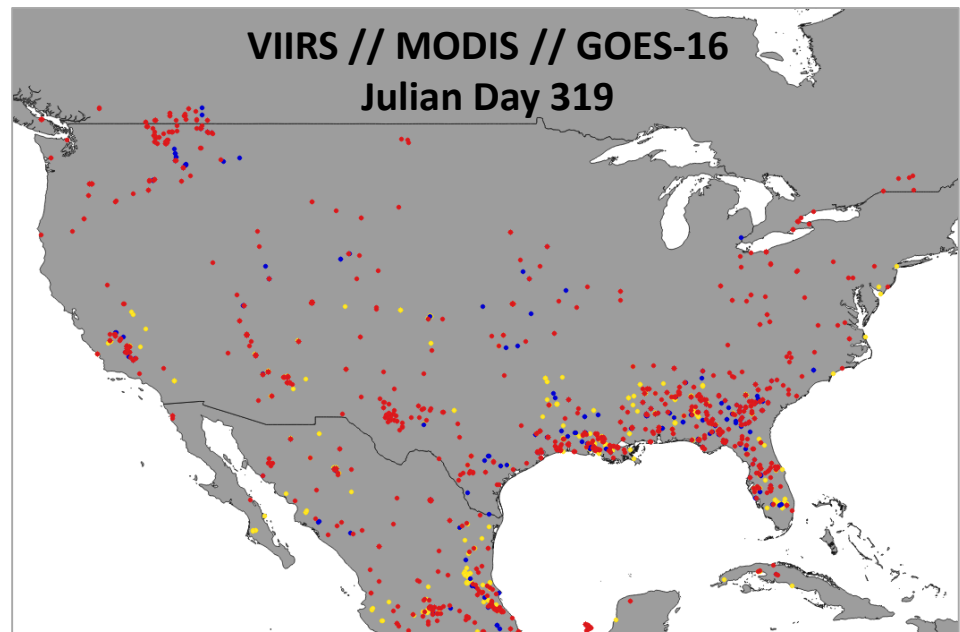
**S-NPP/VIIRS 375m**
**Julian Day 319**

**EOS/MODIS 1km**
**Julian Day 319**
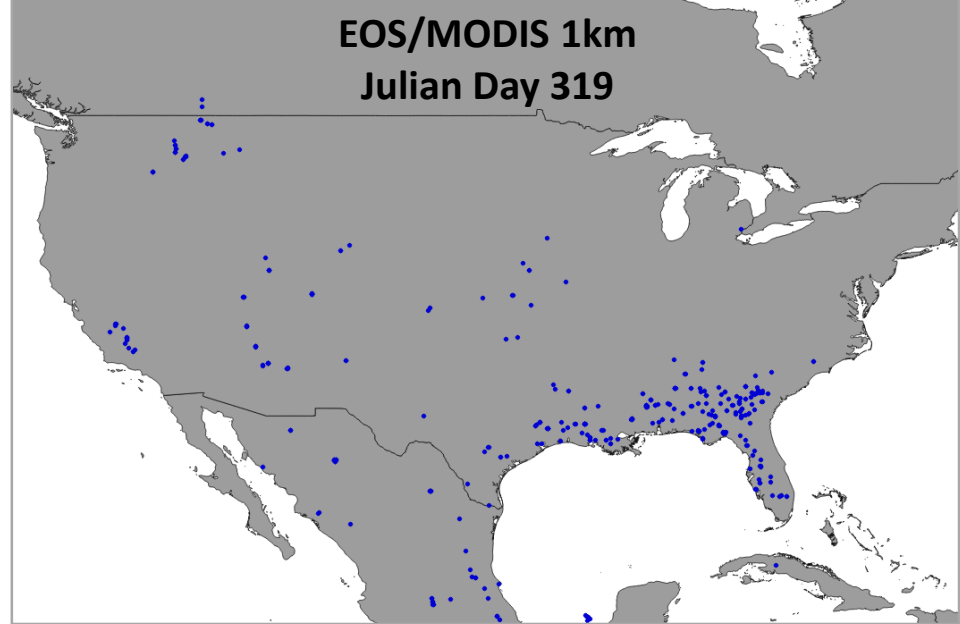
**GOES-16 2km Full Disk (Beta) – Higher Confidence**
**Julian Day 319**

**VIIRS // MODIS // GOES-16**
**Julian Day 319**

# User Outreach

- Project will promote user engagement in coordination with GWIS implementation team

- Leverage GOFC regional fire network workshop initiatives co-sponsored by START, others



2014 SAFNET workshop
Kruger National Park/South Africa



2015 RedLaTIF workshop
INPE-São Paulo/Brazil

# Proposed Schedule

| Task | Dec '17 May '18 | Jun '18 Nov '18 | Dec '18 May '19 | Jun '19 Nov '19 | Dec '19 May '20 | Jun '20 Nov '20 |
|---|---|---|---|---|---|---|
| Gather Data Sets | ▓ | | | | | |
| Data Assessment | | ▓ | ▓ | | | |
| Data Harmonization | | | ▓ | ▓ | | |
| Integrate Data into GWIS | | | ▓ | ▓ | ▓ | |
| Develop Data Analysis Tools | | | | | ▓ | ▓ |
| GWIS Documentation | | | ▓ | ▓ | ▓ | ▓ |
| Regional Workshop | | | ▓ | | ▓ | |
| Conference Attendance | | ▓ | | ▓ | | ▓ |