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

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Team members:

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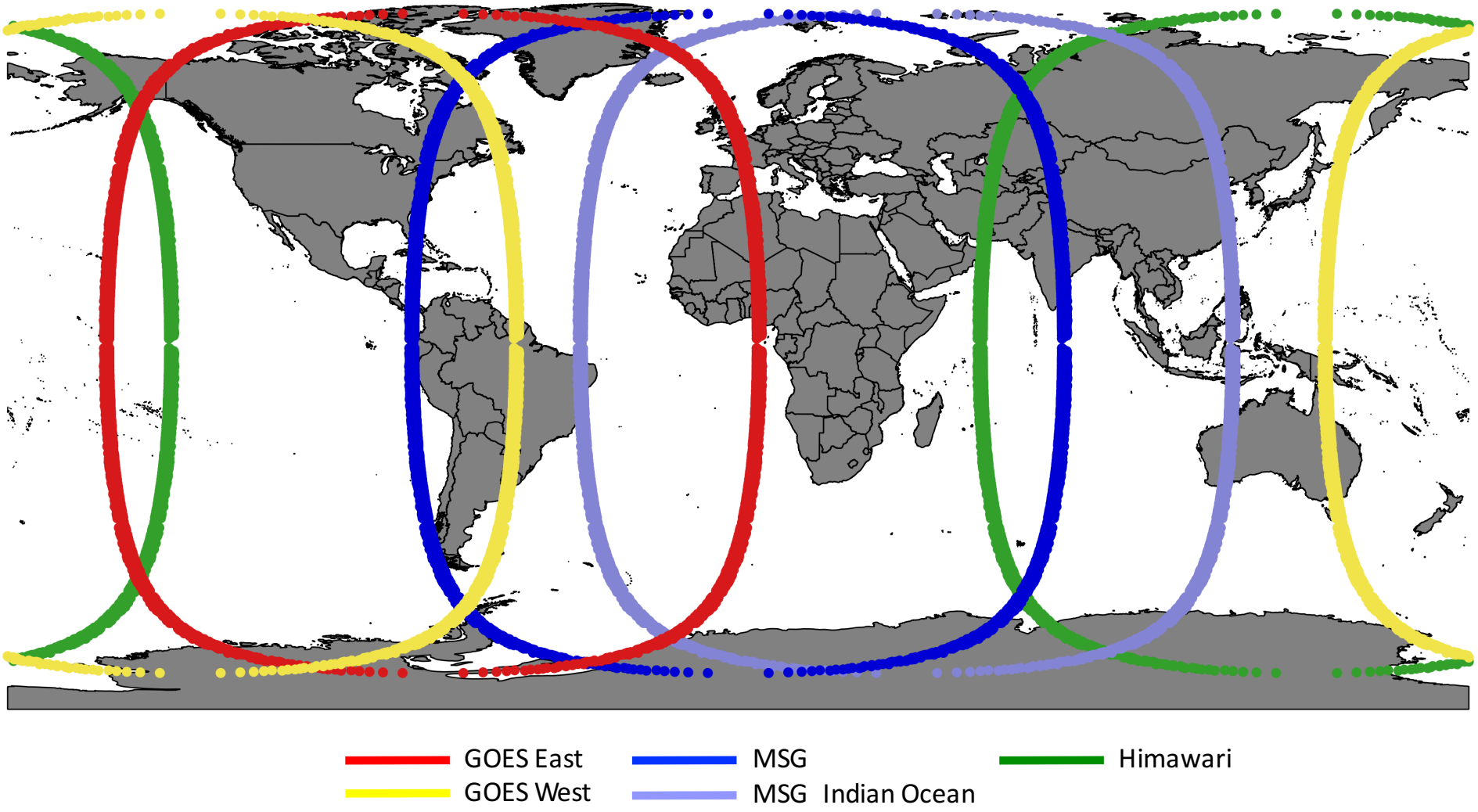
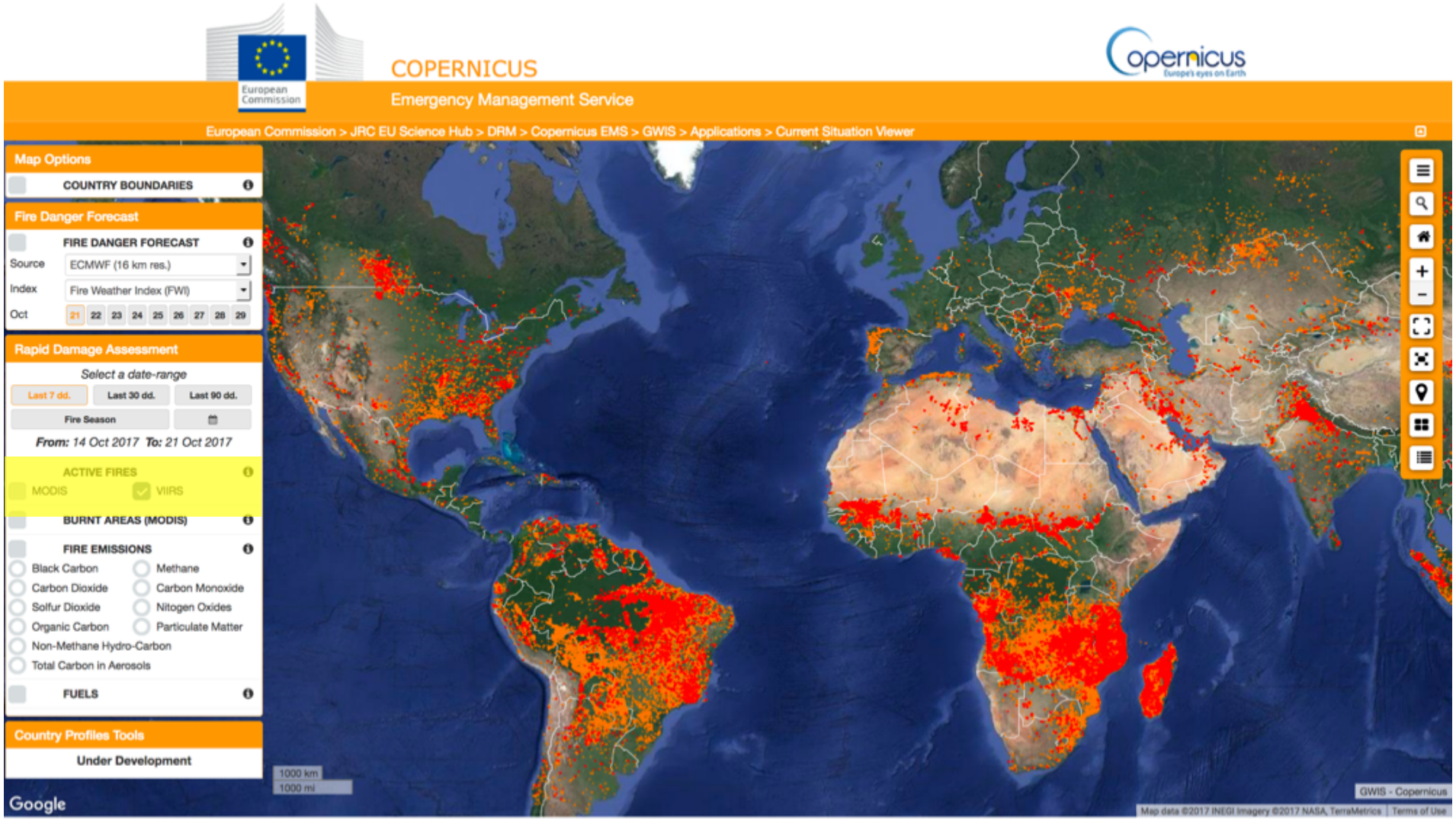
Motivation

- 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
- "*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



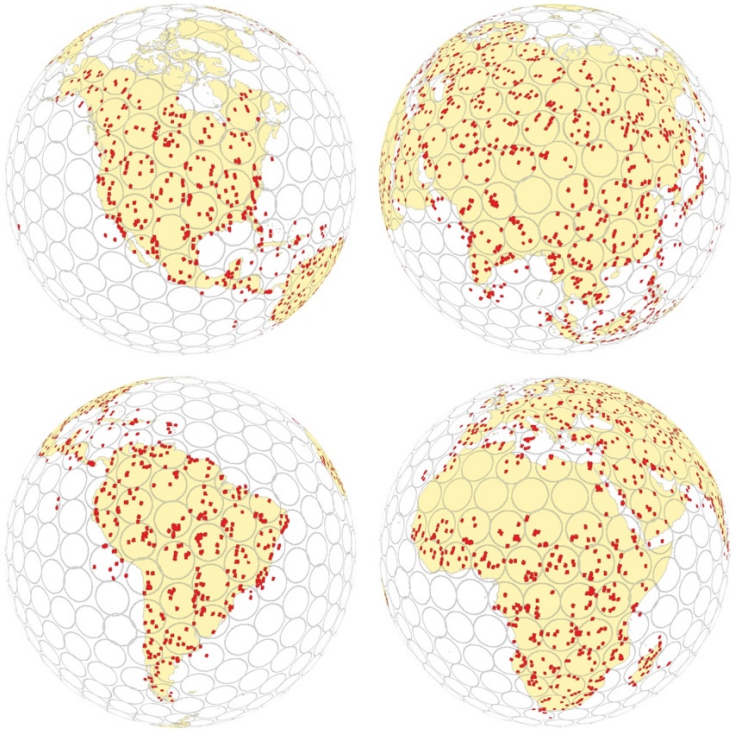
http://gwis.jrc.ec.europa.eu/static/gwis_current_situation/public/index.html

Main Goals

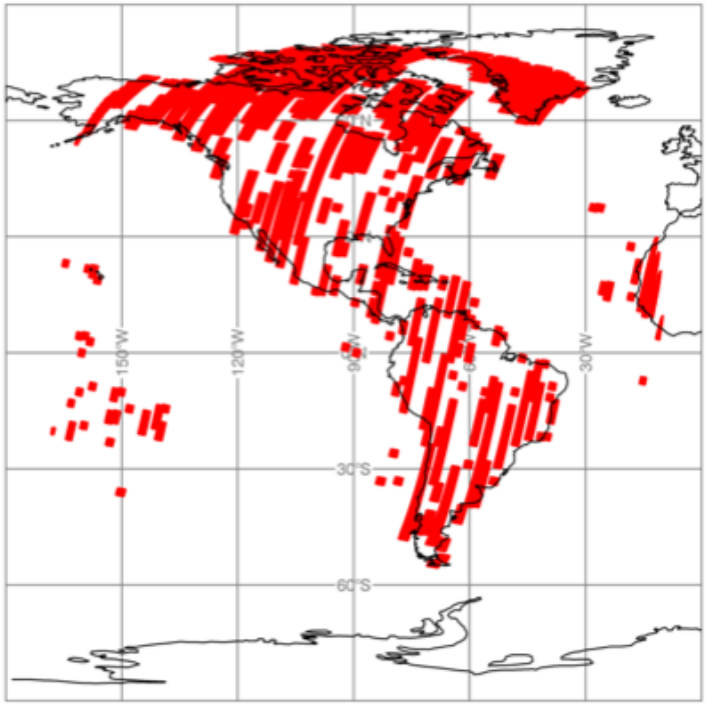
- (i) Augment existing GWIS fire mapping capabilities with the delivery of a harmonized global multi-sensor fire data set
  - Incorporate geostationary fire data sets following comprehensive data validation/quality assessment
- (ii) Propose and demonstrate fire data analyses tools and use those to generate 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 builds 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 & Analysis 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 block-out zones, latitudinal bias

- Support the development of geostationary-specific fire metrics (e.g., tracking diurnal cycle activity)

User Outreach

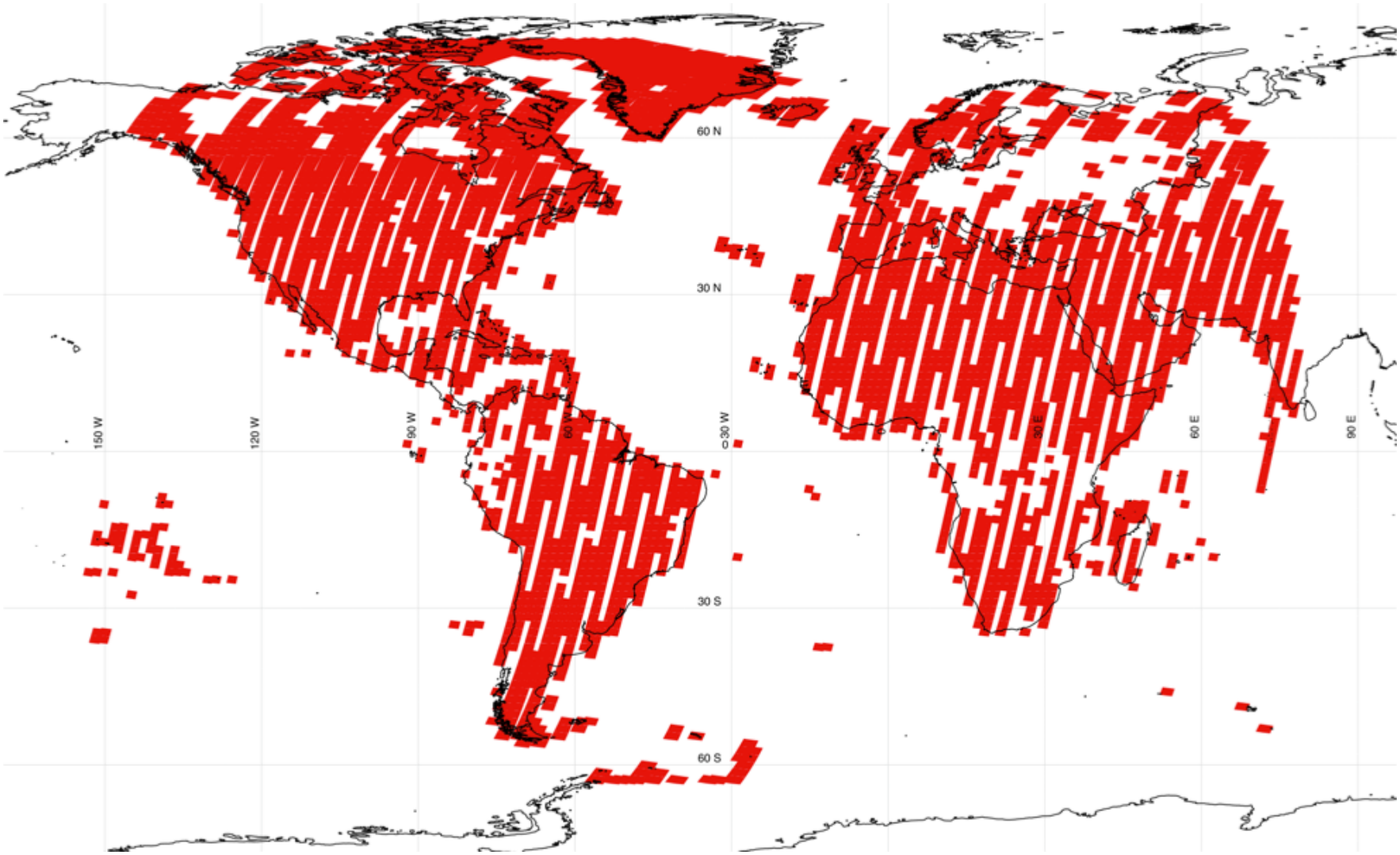
- Project will promote user engagement in coordination with GWIS implementation team
- Leverage GOFC regional fire network workshop initiatives co-sponsored by START, others

2014 SAFNET workshop
Kruger National Park/South Africa

2015 RedLaTIF workshop
INPE-São Paulo/Brazil

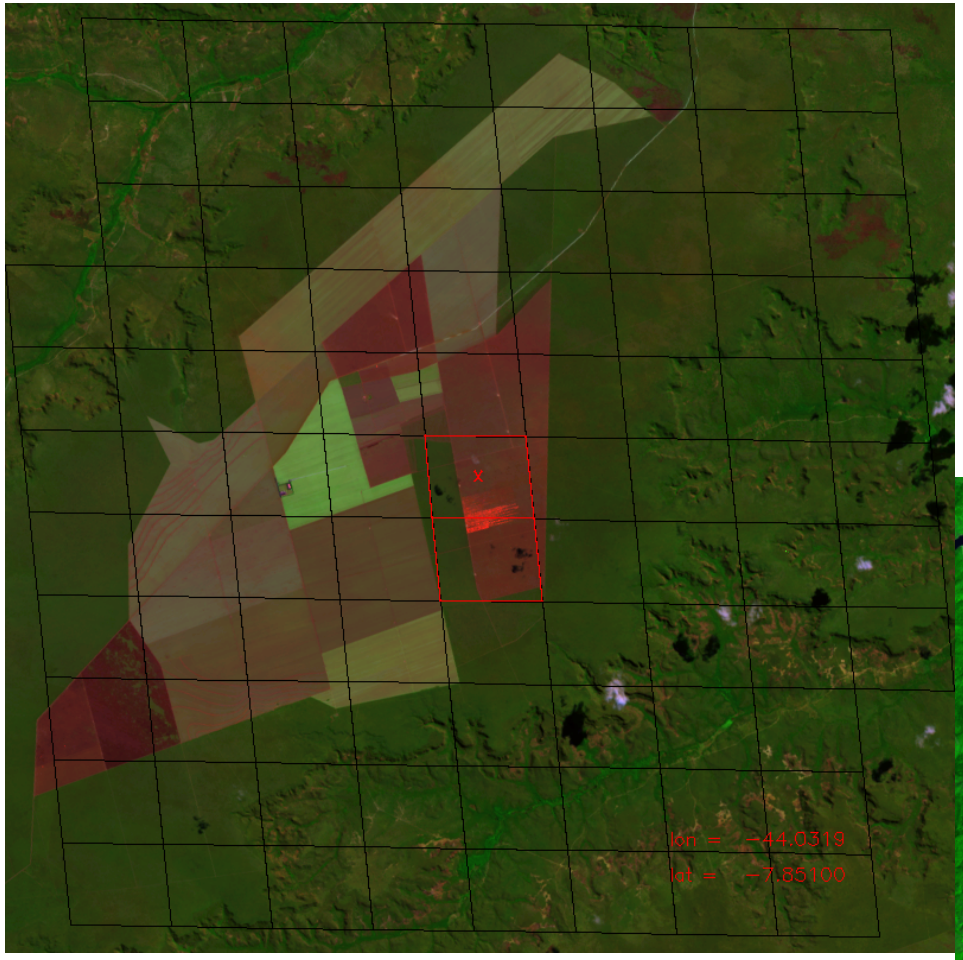
Project Status

- Project kick-off July 2018
- GOES-R data validation routines being adapted to other data sets (MSG, Himawari)
- Several thousand Landsat-8 scenes being downloaded/pre-processed
- Initial assessment targeting GOES-16 data during Jul/Aug 2018 and MSG data during Dec/2017 coinciding with peak fire activity in the respective hemispheres



Processed Landsat scenes as of 28 Sep. 2018

Examples of True Positives



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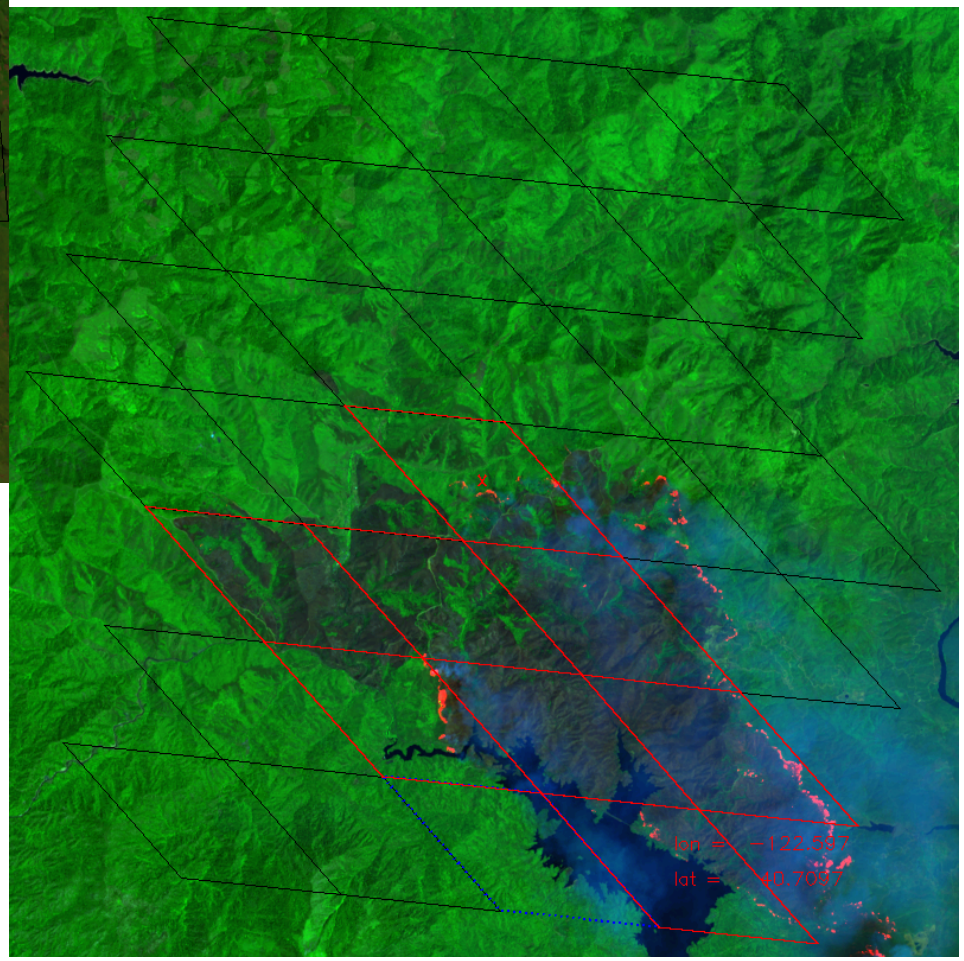
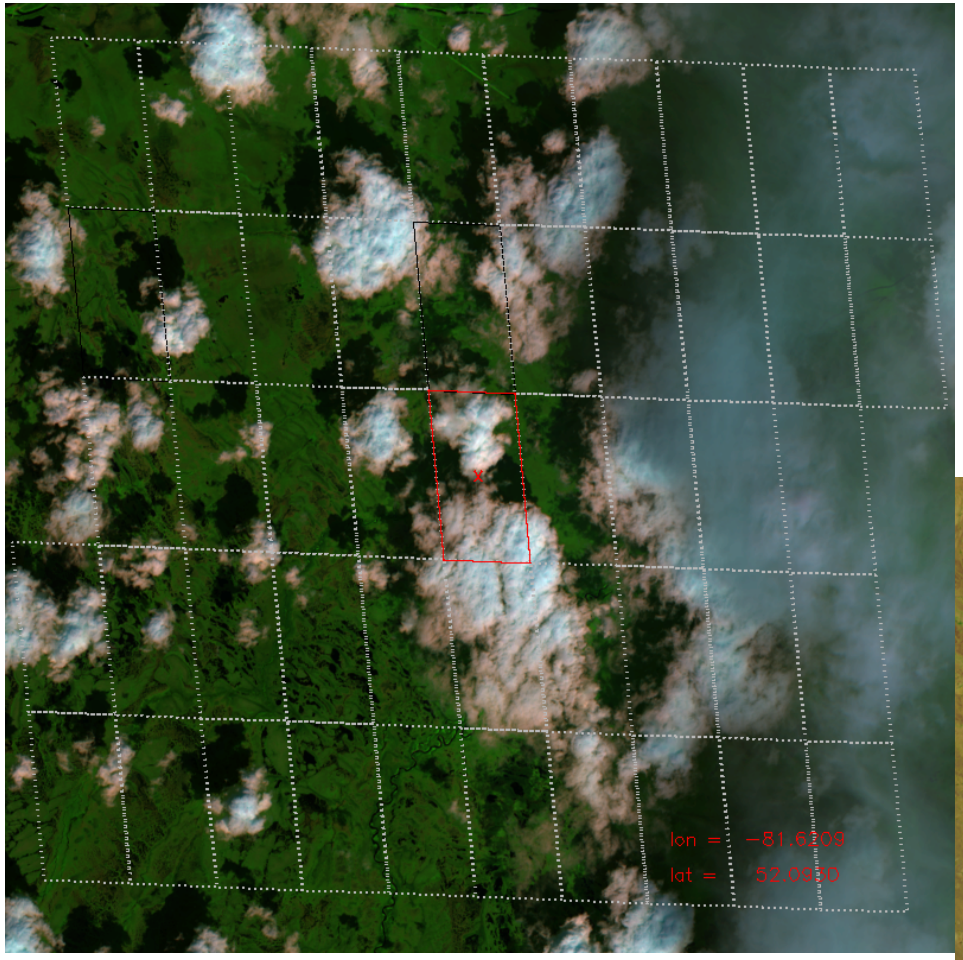


False Alarm Examples



Convective Cloud
2018 199

Hot Surface
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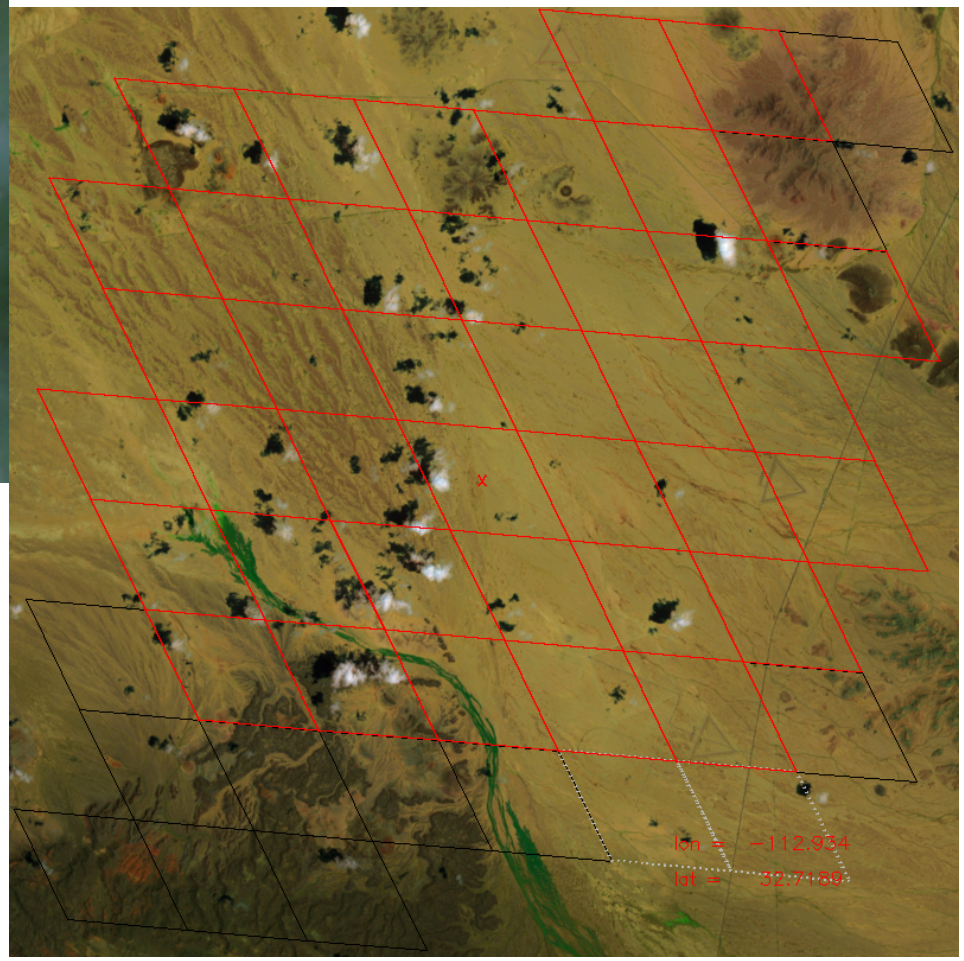
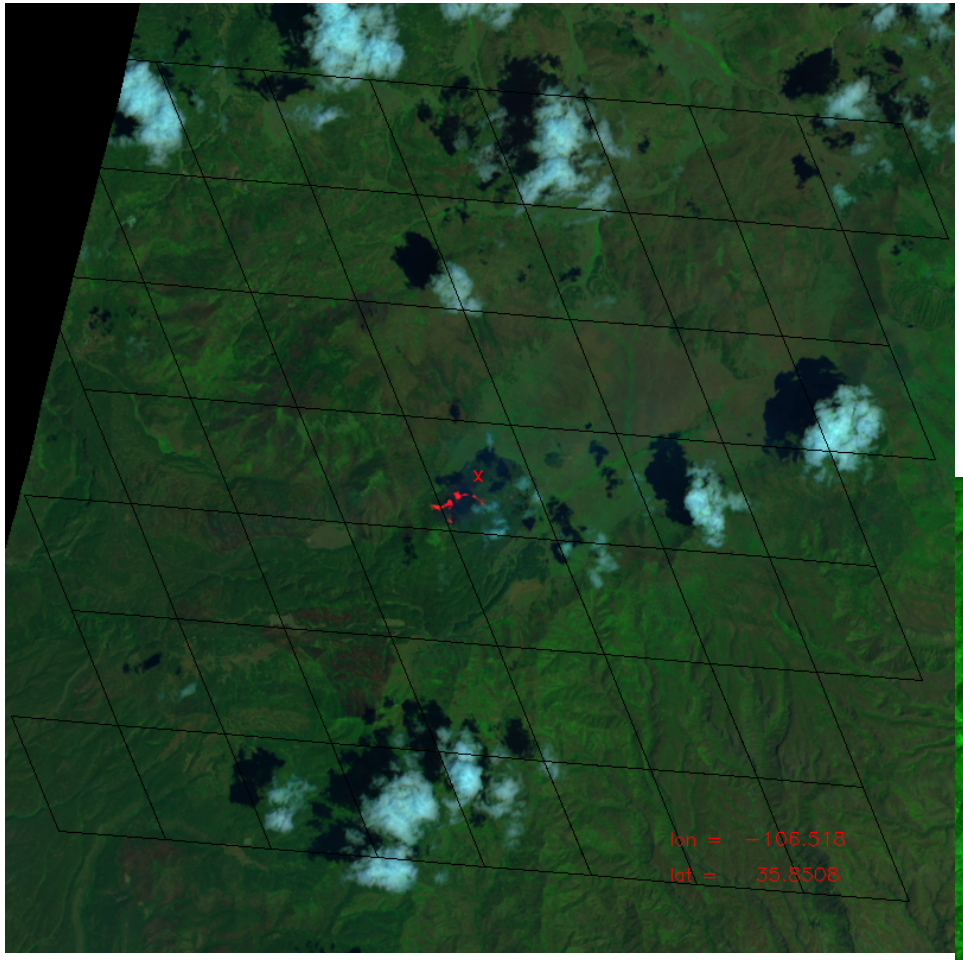


Omission Errors



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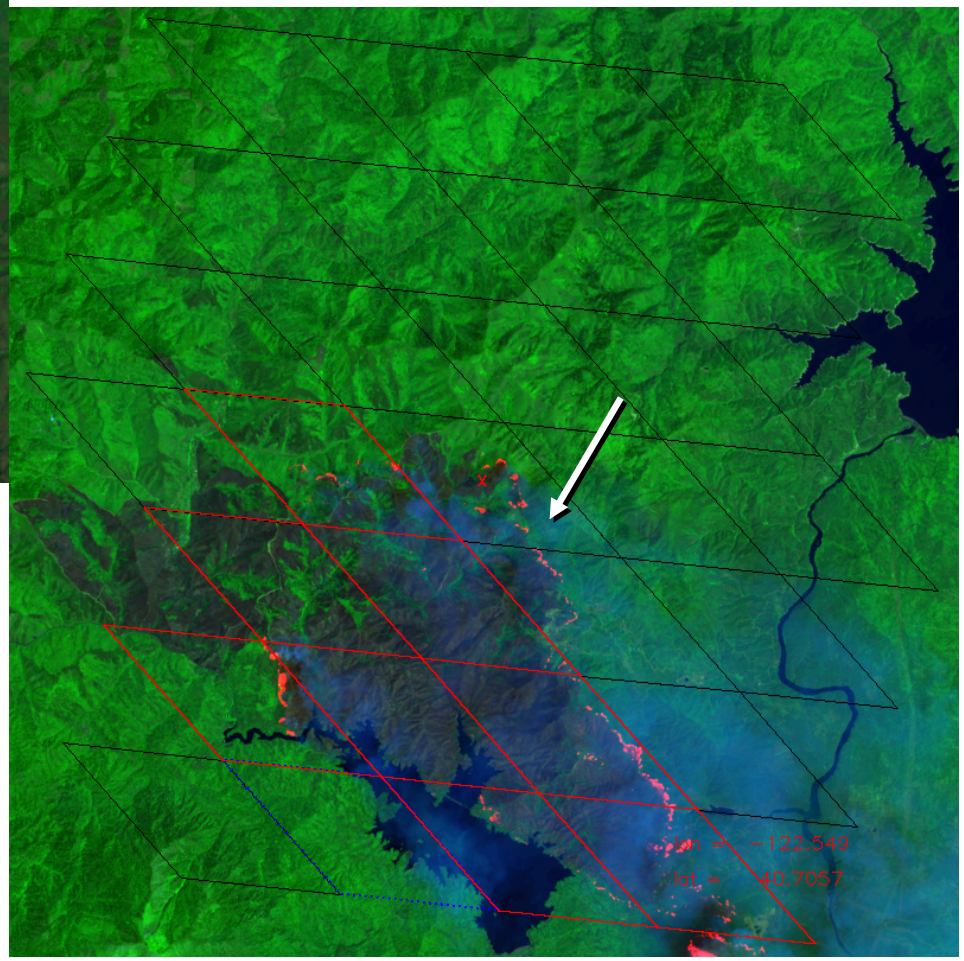

Thanks