

NASA Update Wildland Fire Element

Vince Ambrosia
NASA Applied Science Program



**29 May 2019
TFRSAC Meeting
NASA / Ames Research Park
Moffett Field, CA.**

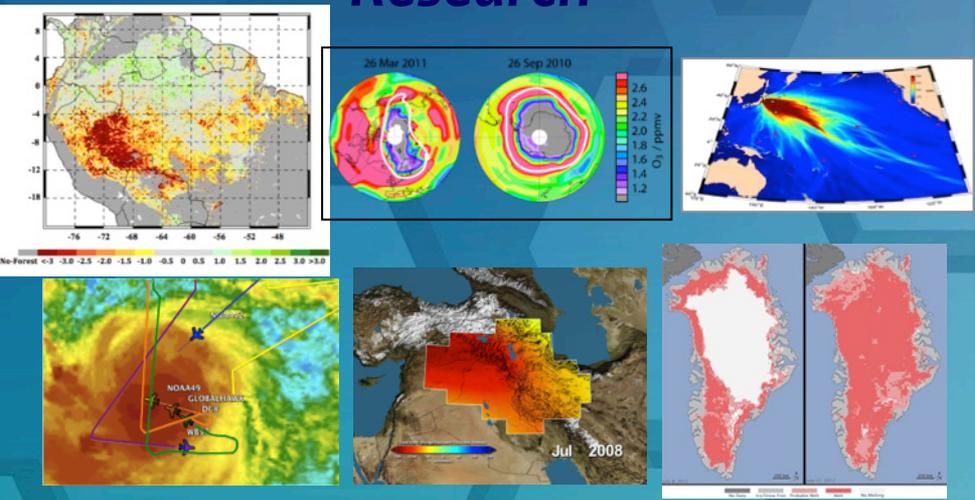




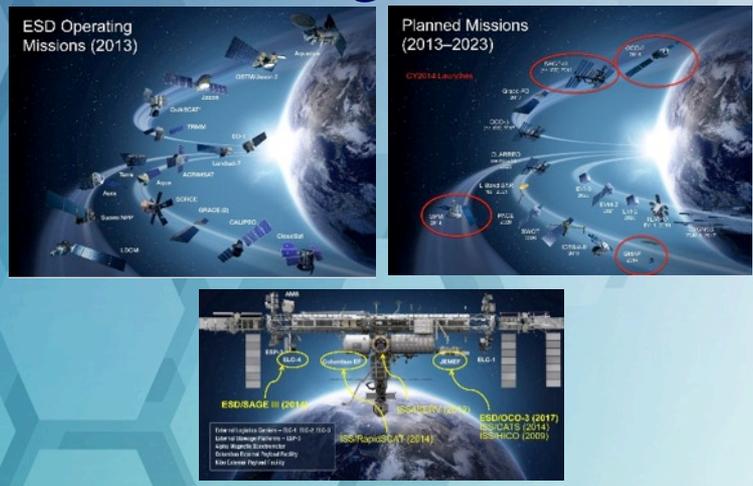
NASA's Earth Science Division



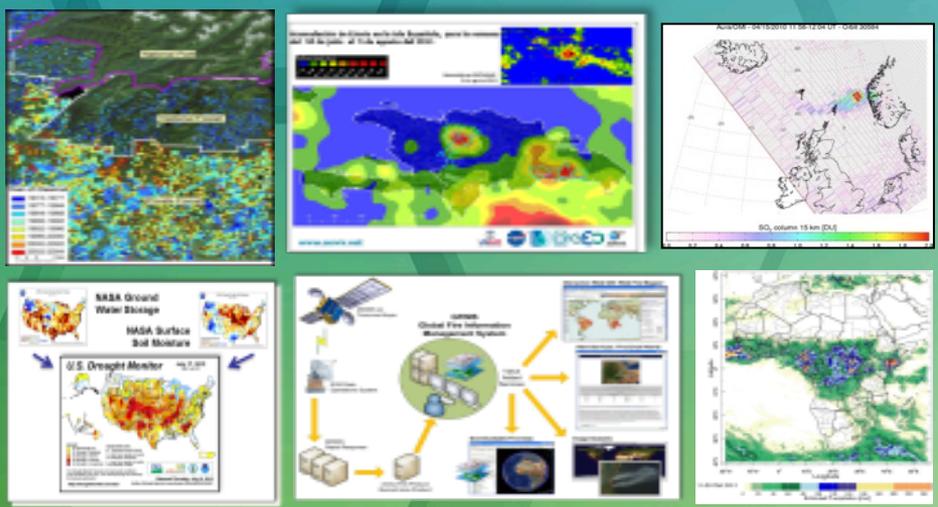
Research



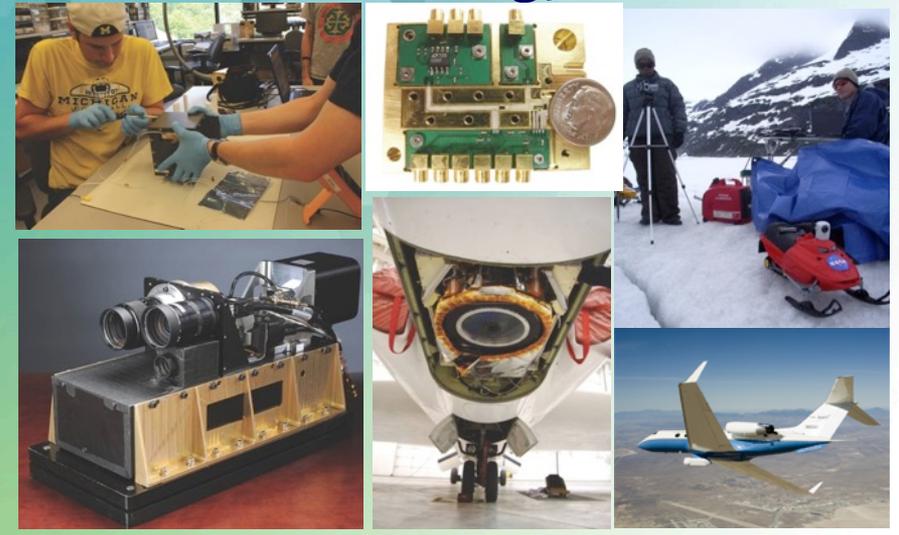
Flight



Applied Sciences



Technology





Applications Themes & Societal Benefit Areas

Emphasis in
4 Applications Areas

Support opportunities in
5 additional areas



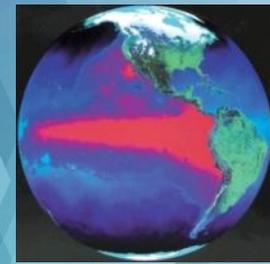
Health &
Air Quality



Water
Resources



Agriculture



Climate



Weather



Disasters



Ecological
Forecasting



Energy



Oceans



Crosscutting theme:
Wildland Fires





NASA ASP Wildfire Management Team



Lawrence Friedl:
NASA Applied Sciences
Program Director

David Green
NASA ASP Disaster Program Manager

Vince Ambrosia:
Associate Program Manager



ROSES-2011 A.35 Phase II Projects



Zachary Holden / USDA Forest Service:

A Prototype System for Predicting Insect and Climate-Induced Impacts on Fire Hazard in Complex Terrain;

Sher Schranz / NOAA:

Wildland Fire Behavior and Risk Prediction;

James Vogelmann / USGS EROS Center

Improving National Shrub and Grass Fuel Maps Using Remote Sensing and Modeling to Support Fire Risk Assessments;

Birgit Peterson / USGS EROS Center:

Enhanced Wildland Fire Management

Karyn Tabor / Conservation International

An Integrated Forest Management

Wilfrid

Projects Closed out September 2017 at end of 4th year of applications development;

- Most projects continued through FY18 (till Sept 2018) via a NCE to complete their work and any SE activities they may have in augmentation.
- Applications development efforts were highlighted at the AFE & IAWF Wildfire Continuum Conference (Special Session & Open Workshop), Missoula, MT, May 21-24, 2018.

Ma... Research Institute (MTRI):

Process-Based Hydrological Models to Increase Understanding of Watersheds and Improve Post-Fire Remediation Efforts;

Keith W... State University

Rehabilitation Capability Convergence for Ecosystem Recovery;



EO Socioeconomic Impacts for Wildfire Support

Solicitation: NASA's objectives are to exercise analytic techniques and methodologies, articulate the impacts of Earth observations applications in social and/or economic terms, contribute to the body of literature, and advance cross-disciplinary connections and collaborations.

- ***Quantifying potential economic benefits of incorporating gridded fuel moisture and weather data into wildland fire decision support in the Northern Rocky Mountains.***

Zachary Holden

- ***Socioeconomic impact analysis of linking remote sensing and process-based hydrological models to improve post-fire remediation efforts.***

Mary Ellen Miller

- ***Using Earth Observations to Assess the Socioeconomic Impact of Human Decision Making during the Suppression of a Wildland Fire***

Sher Schranz

- ***Evaluating the Socioeconomic Impacts of Rapid Assembly and Deployment of Geospatial Data in Wildfire Emergency Response Planning: A Case Study using the NASA RECOVER Decision Support System (DSS)***

Keith Weber



NASA ASP Disaster Management Team

**NASA Applied Sciences Program
Disaster Program Manager:**

David Green

Associate Program Managers:

Vince Ambrosia (Wildland Fire)

Tim Stough (Geophysical Disasters)

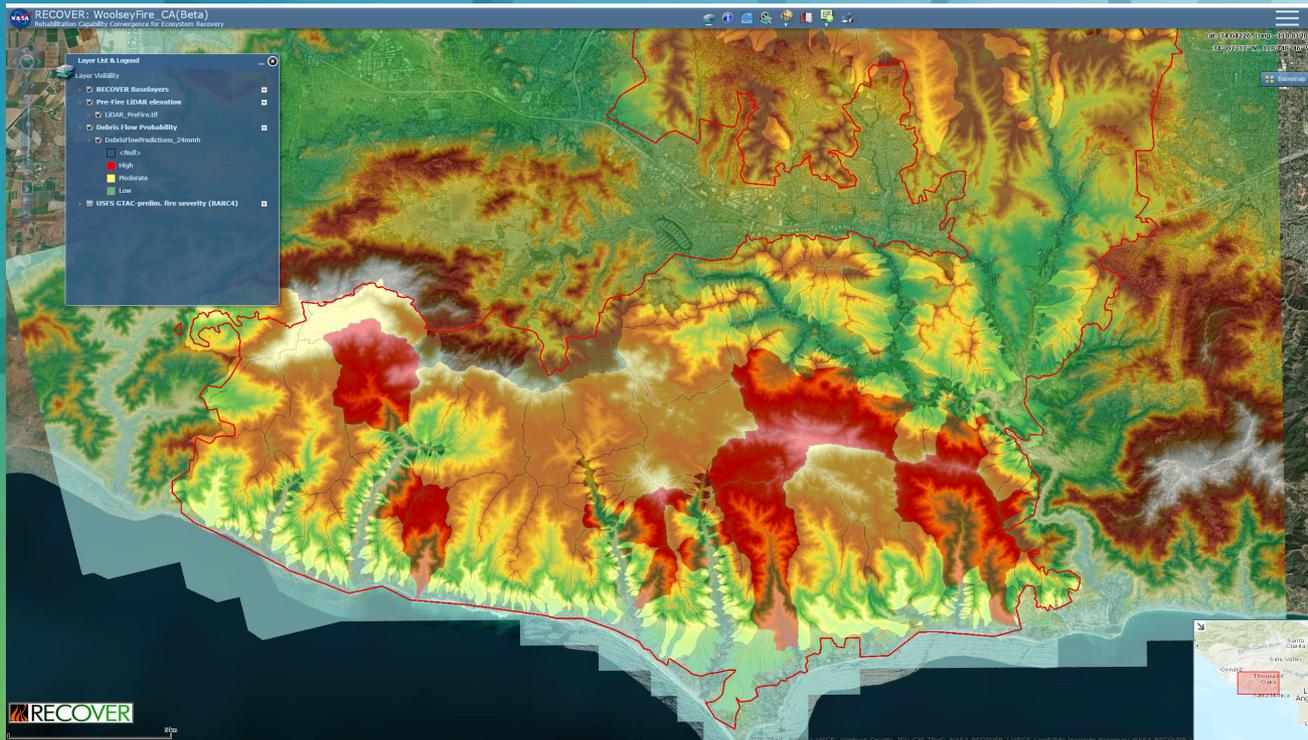
John Murray (Atmospheric & Hydrometeorological Disasters)



Supporting 2018 Wildfires



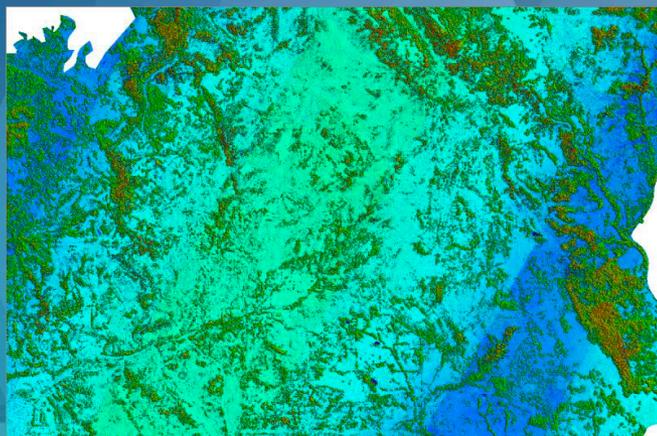
- In 2018, the NASA Applied Science Disaster Program supported a few California wildfires with decision support system tools, and damage assessment maps from UAVSAR and analysis (JPL team) of SENTINEL-1 SAR data. NASA’s ER2, with the MASTER instrument, collected / distributed fire imagery through the Disaster portal for the Mendocino Complex Fires (River & Ranch Fires).
- Keith Weber & Mary Ellen Miller supported post-fire rehab (BAER) work on the the Mendorcino Complex, Carr Fire, Woolsey Fire.



Sonoma County Ag Preservation & Open Space District RRNRESS Project

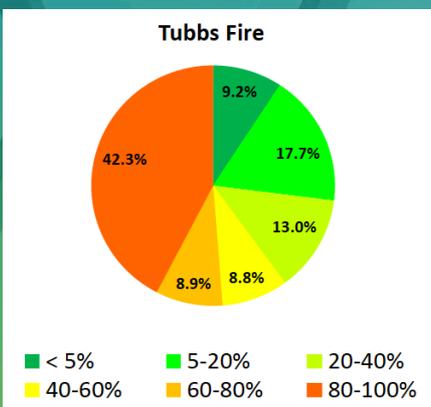


2013 (top) pre-fire vs. 2018 post-fire imagery

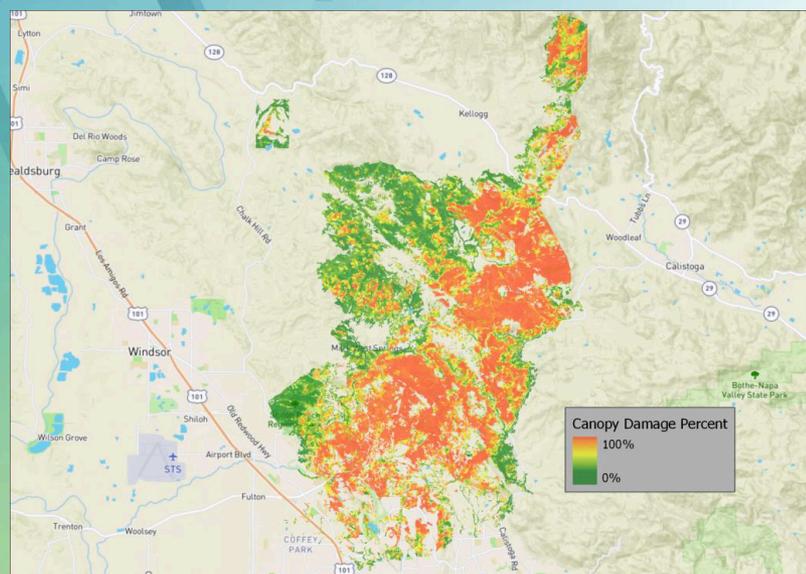


A difference image of the 2013 lidar based nDSM versus the 2018 post fire nDSM.

Tubbs Fire Canopy Damage Map



Percent of Tubbs Fire Area by percent woody damage class.





Disaster Program 2018 Solicitation



NASA ROSES-18 A.37 DISASTERS

“Earth Science Applications: Disaster Risk Reduction and Response”

- ~80 LOI Submitted
- ~40 Proposals Submitted
- Wildland Fire was a solicited element of the overall call for proposals
- Expected Program Budget in 1st year of new awards: ~\$4M
- Submission Closing Date: 29 June 2018
- Period of Performance: 4 years with budget phase-down
- Expected Range of Annual Award / projects:
 - \$400-600K / teams
 - \$150-300K for single applications
- Proposal Panel Reviews: 10-11 Oct 2018

Group on Earth Observations (GEO)



Global Wildfire Information System (GWIS)





NASA GEO Support Solicitation



- Solicitation offered by NASA Earth Science and Applied Science Program;
- To demonstrate a strong ability to support and advance GEO, to further U.S. and NASA interests, and to demonstrate U.S. and NASA commitments to GEO;
- To foster broader domestic involvement in a U.S. national approach to GEO and the Work Programme;
- Advance the use of Earth observations to inform decisions and actions and broaden the organizations routinely using them;
- Increase international collaboration and partnering across GEO and broaden the GEO community.



GWIS Goals in GEO WP 2020-2022



- *Provide harmonized fire information (e.g. fire danger)*
- *Promote networking of fire information providers through annual workshops;*
- *Establish operational links with other wildfire communities;*
- *Integrate / harmonize regional wildfire information data sources;*
- *Develop, implement and promote interoperability and communication*
- *Coordinate / promote capacity building and training activities*

GWIS Timeline



Creation of Forest Fire Experts Group in EC



2001-GOFC-Fire holds a joint workshop with the CEOS LPV on Fire Product Validation in Lisbon



2011-GOFC / EARSeL-FF-SIG Propose GWIS in Stresa, Italy

2013 - Copernicus and GEO support development of GWIS as a extension of EFFIS



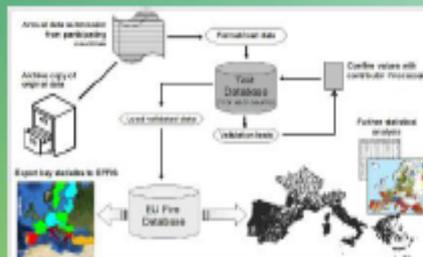
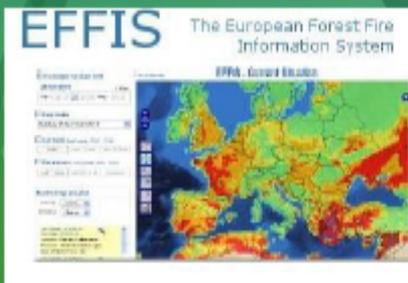
EFFIS becomes operational in 2000

2003-Rapid damage assessment was introduced to EFFIS; quasi-real time maps of burned areas in southern Europe.

2004-EFFIS Fire Database was established

2001-20xx GOFC-GOLD Fire Implementation Team Meetings to promote joint developments of global fire monitoring and EFFIS

GWIS Operational



NASA Supports 3 GWIS Teams
Luigi Boschetti, Robert Field
Schroeder / Giglio



GWIS Leads



Canada (CFS), EC (JRC), South Africa (CSIR), and GTOS (GOFC-GOLD), and U.S. (NASA)

Component Leads & Contributors

- **Jesus San-Miguel-Ayanz (EC-JRC, GOFC-GOLD Fire IT), Chair**
- Krishna Prasad Vadrevu (GOFC-GOLD Fire IT)
- Antonio Martucci (FAO, NRL)
- Bill de Groot (CFS, Canada)
- Fang Chen (Institute of Remote Sensing and Digital Earth –RADI- CAS, China)
- Paolo Fiorucci (CIMA Research Foundation, Italy)
- Vince Ambrosia (NASA Applied Science Program, USA)



GWIS Prototype



GWIS prototype provides a beta web map service (WMS) viewer that includes real-time fire information sets such as Fire Danger, Active Fires, Fire Emissions, Burned Areas, Fuels, and other layers, on a global scale.



February 2017

Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28				

Fire Danger (FWI)

Fire Danger Forecast

Active Fires

MODIS

VIIRS

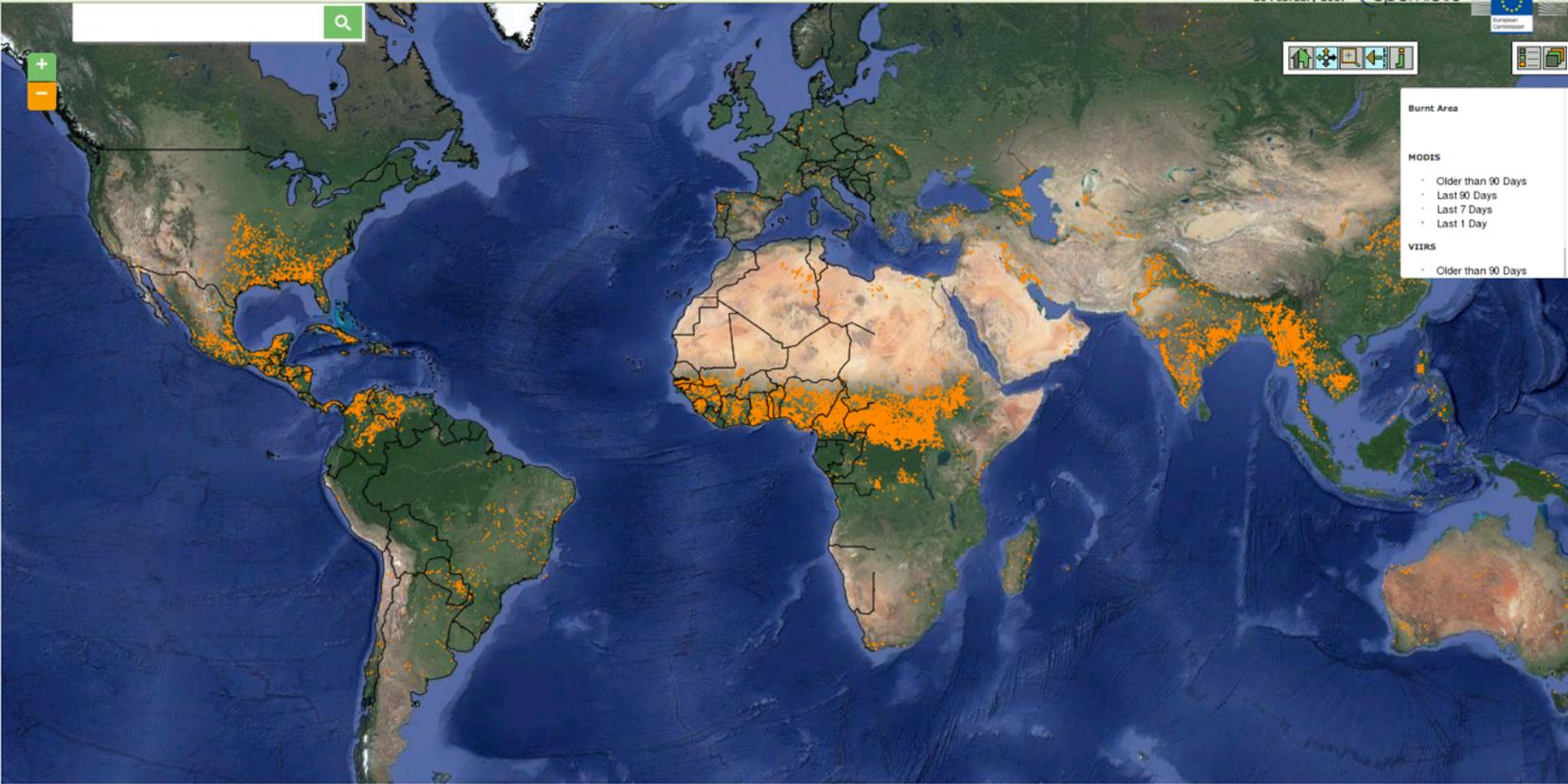
Fire emissions

Burned areas

Fuels

Data Access

Tools/country profiles





NASA GEO-GWIS Selections



A.50 GEO Work Programme

3.8 Global Wildfire Information System (GWIS)

- **Robert Field (Columbia University)**
 - *“Enhancements to the Global Wildfire Fire Information System: Fire Danger Rating and Applications in Indonesia”*
- **Wilfrid Schroeder, et al (University of Maryland / NOAA)**
 - *“Development of a Harmonized Multi-Sensor Global Active Fire Data Set”*
- **Luigi Boschetti / David Roy (U. of Idaho & So. Dakota State Univ.)**
 - *“Using the NASA polar orbiting fire product record to enhance and expand the Global Wildfire Information System (GWIS)”*



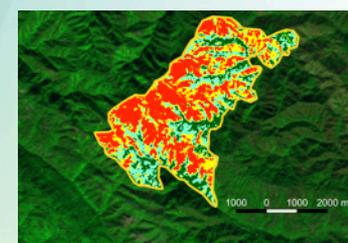
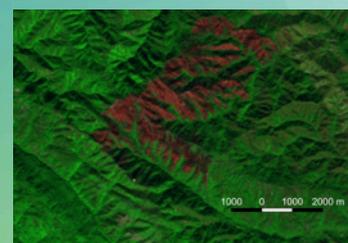
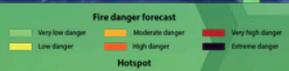
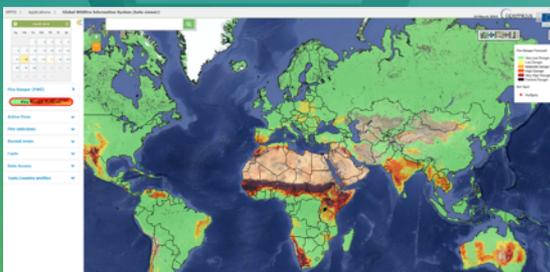
ARSET 2018 Wildfire Applications Webinars

GEO-GWIS

- **Objectives:** Provide an overview of relevant uses of GWIS and navigation through the GEO-GWIS tools and map services
- **Dates:** TBD (in 2018)
- **Agenda / Schedule:** Usually one, 1-hour session per week for 5-week. Materials can be accessed on own time following the completion of the webinar
- **Audience:** National and international entities involved in wildfire management or responsible for providing fire statistics on regional or national wildfire events. Professionals interested in implementing satellite capabilities for wildfire management activities.

Burned Area Detections

- **Objectives:** Utilize an open source tool (QGIS; J. Picotte, USGS-EROS) to download Landsat imagery to identify suitable imagers for fire mapping, and subsequently create an automatically-derived, MTBS-like threshold burn severity products. Provides a much needed tool to allow worldwide users to track and map fires.
- **Dates:** TBD (in 2018)
- **Agenda / Schedule:** TBD; Workshop in conjunction with Josh Picotte (USGS-EROS)
- **Audience:** National and international entities involved in burn severity assessment or providing fire statistics on regional or national wildfire events.



Fire Related Conferences / Workshops / Meeting Participation

- International Association of Wildland Fire (IAWF)/Association of Fire Ecology (AFE) *“Fire Continuum Conference”* (May 2018) Missoula, Mont.)
- 2018 ForestSAT Conference (College Park, MD); 1-5 Oct. 2018
- Global Observation of Forest & Land Cover Dynamics Fire Implementation Team Meeting (College Park, Md.), 2-5 Oct. 2018;
- Fall American Geophysical Union (AGU) Meeting (Washington D.C.) 10-14 Dec. 2018;
- 2018 CA. Wildfire After Action Review (AAR), March Air Reserve Base (ARB), 29-31 Jan. 2019;
- California Council on Science & Technology (CCST) Expert Briefing Series: Emerging Technologies for Real-Time Response to Wildfires; CA. State Legislature / State Capital, Sacramento, CA, 7 Feb. 2019;
- Sonoma County Agricultural Preservation & Open Space District: NASA RRNRESS Project Post-Fire Data & Assessment Workshop, Santa Rosa, CA., 14 March 2019;
- Gordon & Betty Moore Foundation: Fire Immediate Response Workshop, Palo Alto, CA., 24-26 April 2019;



NASA - USDA (USFS) Agreement



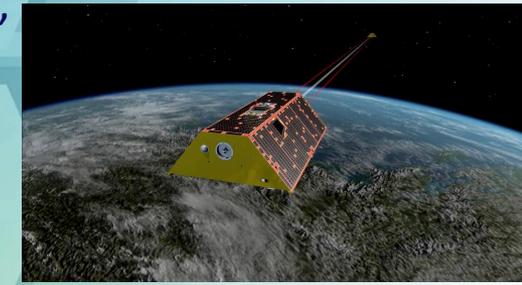
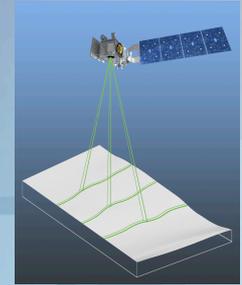
- Addition of Annex to NASA / USDA Umbrella Interagency Agreement created in 2015 (*“Cooperation in Agricultural and Earth Sciences and Applications, Technology, and Education Activities”*)
 - Annex: Evaluate Cloud computing resources for the ingestion, processing and archiving of RT EO data products associated with MODIS, VIIRS, and NOAA-20 geostationary satellite data products.
- Facilitate the transfer of the USFS GTAC X-band Direct broadcast antenna system (Dec 2018) to NASA-ARC.
- Additional Annexes can be made to the original agreement



Recent NASA EO Satellite Launches



- **ICESAT-2:** Ice, Cloud and land Elevation Satellite), launched 9-15-18; Uses lasers and a very precise detection instrument to measure the elevation of Earth's surface.
- **ECOSTRESS:** ECOsystem Spaceborne Thermal Radiometer Experiment on Space Station (ECOSTRESS); launched to ISS on 6/29/18; Measures temperature of plants to better understand how much water plants need and how they respond to stress;
- **GRACE-FO:** Gravity Recovery and Climate Experiment Follow-on , launched 5/22/18; Tracking Earth's water movement to monitor changes in underground water storage, the amount of water in large lakes and rivers, soil moisture, ice sheets and glaciers, and sea level caused by the addition of water to the ocean;
- **GEDI:** Global Ecosystem Dynamic Investigation Lidar, launch date to ISS in 11/18; Characterize the effects of climate change and land use.





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