

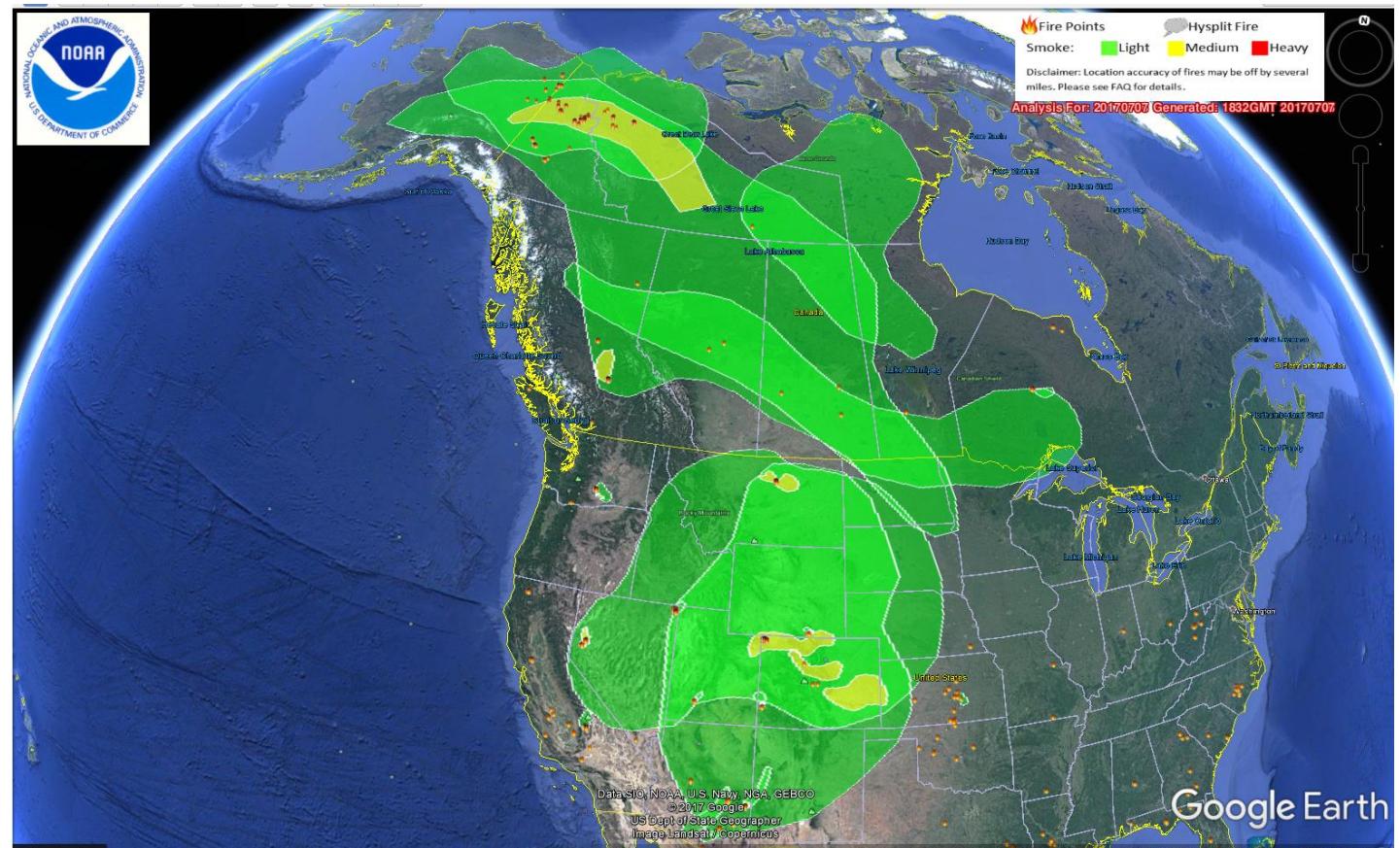
Fire datasets, emissions, forecasting, land cover

Christine Wiedinmyer



Overview

- Emissions from Fires
 - Available inventories
 - Creating your own emissions
 - Input datasets
- Fire Forecasting
 - What's available online data
- What else are you looking for?



Estimating emissions from open burning

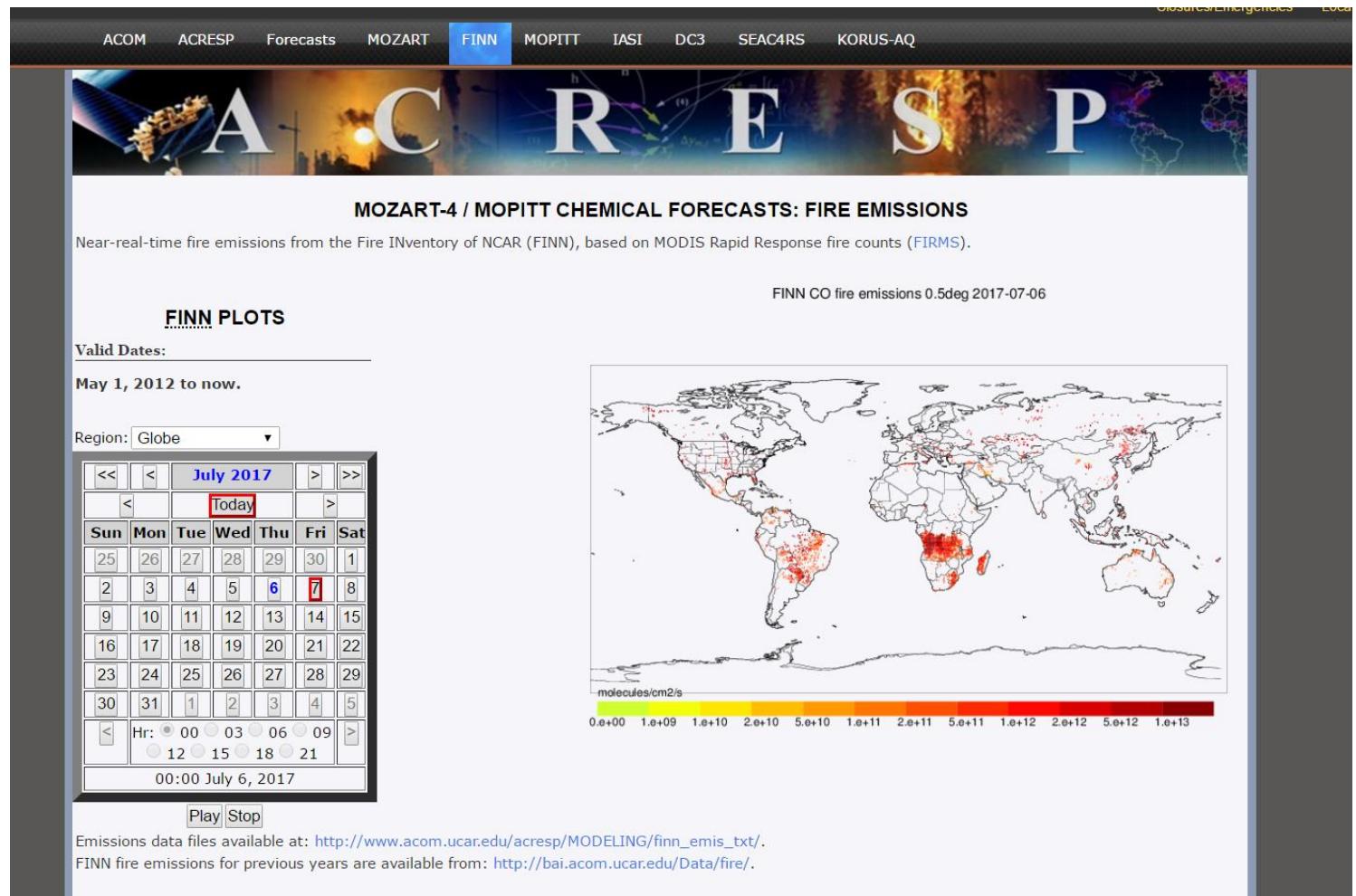
- Fire-Specific Estimates
 - Biscuit Fire (Campbell et al., 2007)
 - Black Saturday Fires Australia (Murphy et al., 2012)
- Regional Models
 - FLAMBE (Reid et al., 2008)
 - North America (Wiedinmyer et al., *AE*, 2006)
 - Himalaya (Vadrevu et al., *AE*, 2011)
 - Western U.S. (Urbanski, *ACP*, 2012)
 - Asia (Song et al., *ERL*, 2010)
 - Western Africa (Liousse et al., 2010)
- Global Models
 - GFED (van der Werf et al., *AC&P*, 2010 and others)
 - FINN (Wiedinmyer et al., *GMD*, 2011)
 - GFAS, (Kaiser et al. *Biogeosciences*, 2012)
 - QFED (Darmenov, A. S., and da Silva, A. 2015. *The Quick Fire Emissions Dataset (QFED): Documentation of versions 2.1, 2.2 and 2.4.* (R. D. Koster, Ed.) (Vol. 38). USA.)

Where can I find these?

- FINN

- Forecast emissions (version 1):

<https://www.acom.ucar.edu/acresp/forecast/fire-emissions.shtml>



Stay prior to the current year. Overlapping years are okay

Where can I find these?

- FINN

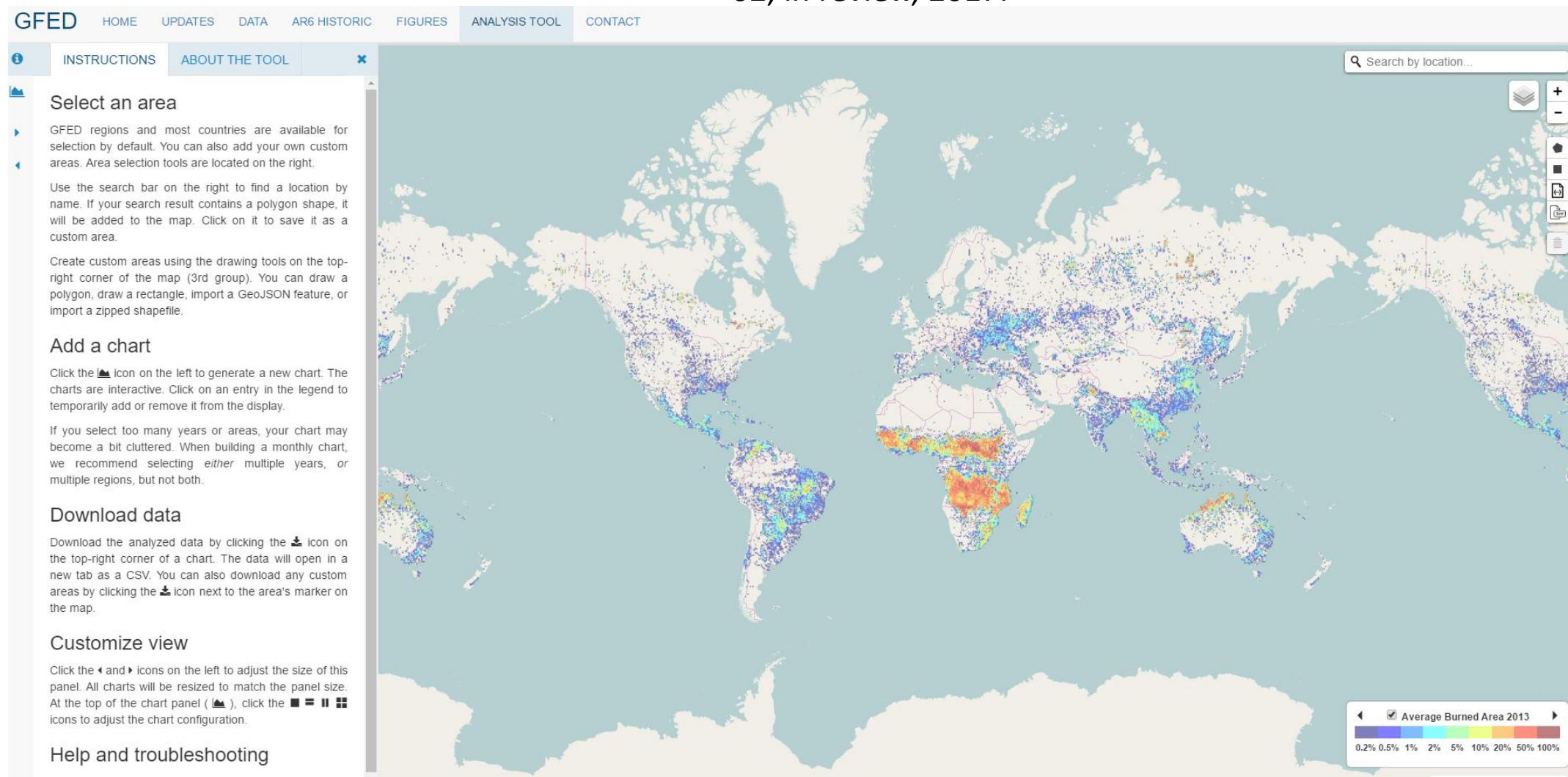
- Forecast emissions (version 1):
[https://www.acom.ucar.edu/acresp/forecast/
fire-emissions.shtml](https://www.acom.ucar.edu/acresp/forecast/fire-emissions.shtml)
- Hindsight emissions (version 1.6):
<http://bai.acom.ucar.edu/Data/fire/>
 - Comma-delimited files
 - Each fire a different entry
 - Developing tool to extract and develop gridded emissions

The screenshot shows a website for the National Center for Atmospheric Research (NCAR) UCAR. The top navigation bar includes links for Home, About, Sections, Observations, Modeling, Publications, Events, Opportunities, People, and For Staff, along with a Search bar. The main content area is titled "FIRE EMISSION FACTORS AND EMISSION INVENTORIES" and is associated with the "Atmospheric Chemistry Observations & Modeling" program. A sidebar on the left lists "Regional & Process Modeling", "FINN", and "FINN Data", with "FINN Data" currently selected. The main content area contains a form for users to submit their contact information, including fields for Name, Institution or Company, E-mail, and a text area for How you intend to use these files. Below the form, a section titled "1) Fire INventory from NCAR (FINN), Version 1.5" is described as "Wiedinmyer et al., Geoscientific Model Development, 2011". A note asks users to choose a time period and speciation desired, with radio buttons for various years and models (MOZART4, SAPRC99, GEOS-chem). A "Notes:" section at the bottom provides links for file format, README files, and GEOS-chem information.

Where can I find these?

- GFED

- <http://www.globalfiredata.org/>



van der Werf, G. R., Randerson, J. T., Giglio, L., van Leeuwen, T. T., Chen, Y., Rogers, B. M., Mu, M., van Marle, M. J. E., Morton, D. C., Collatz, G. J., Yokelson, R. J., and Kasibhatla, P. S.: Global fire emissions estimates during 1997–2015, *Earth Syst. Sci. Data Discuss.*, <https://doi.org/10.5194/essd-2016-62>, in review, 2017.

Where can I find these?

- QFED

- Darmenov, A., and da Silva, A. M.: The Quick Fire Emissions Dataset (QFED) - Documentation of versions 2.1, 2.2 and 2.4, NASA TM-2013-104606, Vol. 32, (<http://gmao.gsfc.nasa.gov/pubs/tm/>), 183 pp, 2013.
- 0.1 degree gridded data, 2000- November 2016 available at:
 - <ftp://iesa@ftp.nccs.nasa.gov/aerosol/emissions/QFED/v2.4r6/0.1/>
 - Monthly files by compound in NetCDF file format

Index of /aerosol/emissions/QFED/v2.4r6/0.1/Y2016/M11/

	Name	Size	Date Modified
 [parent directory]			
 qfed2.emis_acet.005.20161101.nc4	819 kB	11/9/16, 5:00:00 PM	
 qfed2.emis_ald.005.20161101.nc4	819 kB	11/9/16, 5:00:00 PM	
 qfed2.emis_alk.005.20161101.nc4	819 kB	11/9/16, 5:00:00 PM	
 qfed2.emis_bc.005.20161101.nc4	819 kB	11/9/16, 5:00:00 PM	
 qfed2.emis_c2h6.005.20161101.nc4	819 kB	11/9/16, 5:00:00 PM	
 qfed2.emis_c3h6.005.20161101.nc4	819 kB	11/9/16, 5:00:00 PM	
 qfed2.emis_c3h8.005.20161101.nc4	819 kB	11/9/16, 5:00:00 PM	
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 qfed2.emis_no.005.20161101.nc4	819 kB	11/9/16, 5:00:00 PM	
 qfed2.emis_oc.005.20161101.nc4	819 kB	11/9/16, 5:00:00 PM	
 qfed2.emis_pm25.005.20161101.nc4	819 kB	11/9/16, 5:00:00 PM	
 qfed2.emis_so2.005.20161101.nc4	819 kB	11/9/16, 5:00:00 PM	

Where can I find these?

- GFAS

- Kaiser et al, *Biogeosciences*, 2012
 - <http://www.biogeosciences.net/9/527/2012/bg-9-527-2012.pdf>

- <http://atmosphere.copernicus.eu/documentation-fire-emissions>

The screenshot shows the Copernicus Atmosphere Monitoring Service website. The header includes the Copernicus logo, the Atmosphere Monitoring Service logo, social media icons, a search bar, and a 'Contact us' button. The main navigation menu has links for Home, ABOUT CAMS, NEWS & MEDIA, EVENTS, CATALOGUE, RESOURCES, TENDERS, and HELP & SUPPORT. The page title is 'Documentation for Fire Emissions'. The main content area features a 'Documentation for the Global Fire Assimilation System (GFAS)' section with links to daily FRP analysis, the product catalogue, and a Web API interface. It also lists GFAS versions (1.2, 1.1, 1.0) and a note about the documentation for GFASv1.2. To the right, there is a 'SERVICE THEMES' sidebar with links to Air Quality & Atmospheric Composition, Climate Forcing, Ozone Layer & UV, Solar Radiation, and Emissions and Surface Fluxes. Another sidebar at the bottom right is titled 'ANALYSES' with a link to European Air Quality Fire Monitoring.

Home

Documentation for Fire Emissions

Documentation for the Global Fire Assimilation System (GFAS)

The latest daily Fire Radiative Power (FRP) analysis from GFAS is available [here](#)

The catalogue of the archived GFAS products is available [here](#)

GFAS data can also be accessed through a [Web API interface](#)

GFAS versions (most recent first)

- GFASv1.2
- GFASv1.1
- GFASv1.0

This is the documentation for GFASv1.2. Documentation for older versions of GFAS is available [here](#).

SERVICE THEMES

AIR QUALITY & ATMOSPHERIC COMPOSITION

CLIMATE FORCING

OZONE LAYER & UV

SOLAR RADIATION

EMISSIONS AND SURFACE FLUXES

ANALYSES

European Air Quality Fire Monitoring

Estimating emissions

$$Emissions_i = f(A(x,t), B(x,t), E_{f_i})$$

A(x,t): Area burned

B(x,t): Biomass burned (biomass burned/area)

- type of vegetation (ecology)
- fuel characteristics:
 - amounts of woody biomass, leaf biomass, litter, ...
- fuel condition
 - moisture content

E_{fi}: Emission factor (mass emission_i /biomass burned)

- fuel characteristics
- fuel condition

Emission factors for open and domestic biomass burning for use in atmospheric models

S. K. Akagi¹, R. J. Yokelson¹, C. Wiedinmyer², M. J. Alvarado³, J. S. Reid⁴, T. Karl², J. D. Crounse⁵, and P. O. Wennberg⁶

Atmos. Chem. Phys., 11, 4039–4072, 2011

www.atmos-chem-phys.net/11/4039/2011/

[doi:10.5194/acp-11-4039-2011](https://doi.org/10.5194/acp-11-4039-2011)

Published 2011

2015 Update at:

<http://bai.acom.ucar.edu/Data/fire/>

<http://bai.acom.ucar.edu/Data/fire/finn-subset.shtml>

Chemistry of Emissions

- Applications for models
- How explicit do we need the emissions?
- Temporal changes in emissions
- Controlling variables:
 - Fire conditions (i.e., temperature, flaming/smoldering)
 - Vegetation type, density
 - Vegetation conditions (i.e., drought stressed)

Fire Locations

- <https://earthdata.nasa.gov/earth-observation-data/near-real-time/firms>

MODIS and VIIRS fire detections
Current and Archived Data
Text, KML, or GIS shapefiles

Data
Disciplines: [View](#)

Related Content

[Tropical Storm Nanmadol in the western Pacific Ocean](#)

[Tropical Storm Dora off the coast of Mexico](#)

[EOSDIS Data News - 6/23/2017](#)

[Wildfire in Portugal](#)

[Webinar: Access and Visualize Model Data at the NASA GES DISC](#)

More Resources

[Common Metadata Repository \(CMR\)](#)

[Earthdata Search](#)

[Global Imagery Browse Services \(GIBS\)](#)

[LANCE: Land, Atmosphere Near Real-Time Capability for EOS](#)

[Worldview](#)

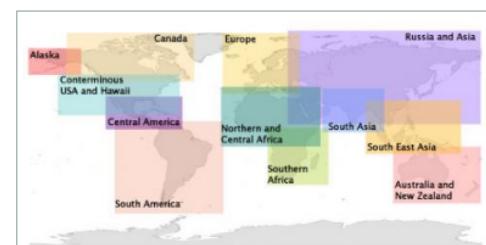
Active Fire Data

Download active fire products from the Moderate Resolution Imaging Spectroradiometer (MODIS) (MCD14DL) and the Visible Infrared Imaging Radiometer Suite (VIIRS) 375 m (VNP14IMGTDL_NRT) for the last 24, 48 hours and 7 days in shapefile, KML, WMS or text file formats. The VIIRS 375 m active fire product is the latest product to be added to the Fire Information for Resource Management System (FIRMS). VIIRS data complement the MODIS fire detections but the improved spatial resolution of the 375 m data provides a greater response over fires of relatively small areas. [Read more about VIIRS...](#)

Data older than 7 days can be obtained from the [Archive Download Tool](#). Users intending to perform scientific analysis are advised to download the data.

Please note:

- MODIS C6 is available from November 2000 (for Terra) and from July 2002 (for Aqua) to the present.
- VIIRS 375 m near real-time (NRT) data is currently available from 8 January 2016 (NRT data are distinct from standard quality data).



Shapefile

KML

TXT

WMS

Archive Download Tool

Global Fire Maps

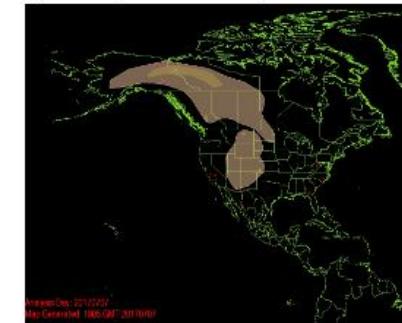
Fire Locations

- NOAA Hazard Mapping System
 - <http://www.ospo.noaa.gov/Products/land/hms.html>

Hazard Mapping System Fire and Smoke Product

Current HMS Analysis

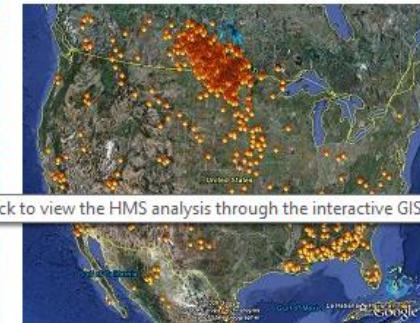
Analysis for day 7/7/2017 last updated at 7/7/2017 21:40:42 GMT



Current HMS Fire and Smoke Analysis



Download GIS files from
<ftp://satepsanone.nesdis.noaa.gov/FIRE/HMS/GIS>



Google KML files: [Fire](#) | [Smoke](#) | [Hysplit](#)

Click to view the HMS analysis through the interactive GIS webpage

Real-Time Satellite Imagery



GOES West



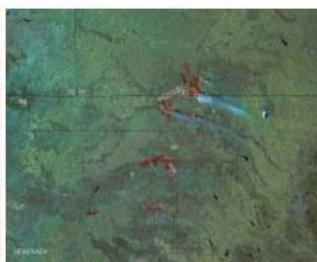
GOES Fa



Active Fire Floater Imager



NASA MODIS Rapid Response



VIIRS Remapped Projection

Fire Locations

- USFS RSAC
 - <https://fsapps.nwcg.gov/afm/>

Current Large Incidents (Home)

New Large Incidents

Fire Detection Maps

MODIS Satellite Imagery

VIIRS Satellite Imagery

Fire Detection GIS Data

Fire Data in Google Earth

Fire Data Web Services

Latest Detected Fire Activity

Other MODIS Products

Frequently Asked Questions

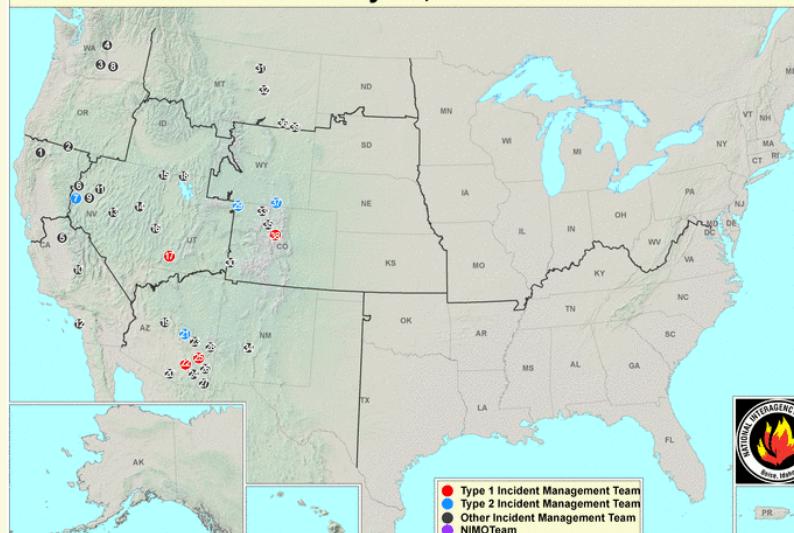
About Active Fire Maps

RSAC
Remote Sensing Applications Center
2222 West 2300 South
Salt Lake City, UT
84119 - 2020
voice: (801) 975-3737
fax: (801) 975-3478

Fire locations are based on data provided by the National Interagency Coordination Center and are subject to change.
Large incident map currently updated on Fridays or as fire conditions warrant.

Current Large Incidents

July 07, 2017



IMSR Summary
July 7th, 2017

National Preparedness Level

Level 3
National Fire Activity
Initial attack activity: Moderate (216) new fires
New large incidents: 12
Large fires contained: 7
Uncontained large fires: 27
Area Command Teams Committed: 0
NIMOs committed: 0
Type 1 IMTs committed: 4
Type 2 IMTs committed: 8

Source:
[Incident Management Situation Report](#)

Active Fire Mapping News
May 15, 2017

WARNING

Website Accessibility Alert: The Active Fire Mapping Program website, data, products and services will be unavailable starting **11AM MDT Wednesday May 17, 2017 until 8AM MDT Thursday May 18, 2017** due to data center maintenance issues.

[View map with Greater Sage-Grouse habitat layer.](#)

[View Printable Map](#) [View High Resolution Map](#) [Definition of Map Terms](#) [Download KMZ File](#) [Select a Fire](#) [Go](#)

1 FAY	11 LIMERICK	1 HILLTOP	1 JULY
2 WILLOW	12 CRISTIANITOS	2 BURRO	2 KELLY
3 RATTLESNAKE HILLS	13 TAR CREEK	3 GIMME	3 MILL CREEK
4 MITCHELL	14 HOBSON	4 SWISSHELMNS	4 TIFFANY
5 SPRING	15 DRY GULCH	5 FRYE	5 GUTZLER
6 WINNEMUCCA RANCH	16 HATCHERY	6 SHEEP	6 LEE CREEK
7 EARTHSTONE	17 BRIANHEAD	7 SADDLE	7 KEYSTONE
8 SILVER DOLLAR	18 CEDAR HILLS	8 SH CREEK	8 PEAK 2
9 TRUCKEE	19 GOODWIN	9 PEEKABOO	9 PLUM POWDER RIVER
10 SCHAEFFER	20 ELK HORN	10 EAST RIM	

Fire Locations

- USFS RSAC

- <https://fsapps.nwcg.gov/afm/>
- MODIS, VIIRS, AVHRR, GOES

Current Large Incidents (Home)

New Large Incidents

Fire Detection Maps

MODIS Satellite Imagery

VIIRS Satellite Imagery

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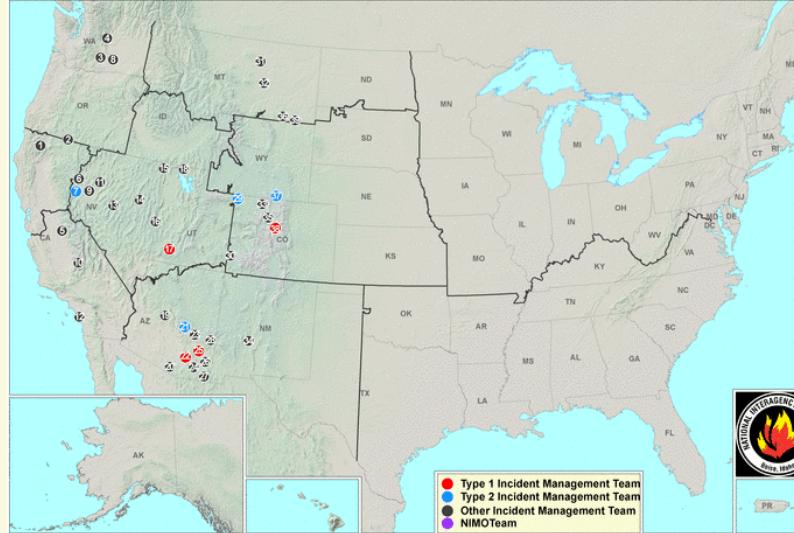


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[View Printable Map](#) [View High Resolution Map](#) [Definition of Map Terms](#) [Download KMZ File](#) [Select a Fire](#) [Go](#)

Other resources about fire locations, etc.

- Wildfire Automated Biomass Burning Algorithm (WFABBA)
 - <http://wfabba.ssec.wisc.edu/>
 - North and South America
- InciWeb
 - <https://inciweb.nwcg.gov/>
- NIFC
 - <https://www.nifc.gov/>
- NICC
 - <https://www.predictiveservices.nifc.gov/intelligence/intelligence.htm>

Burned area data

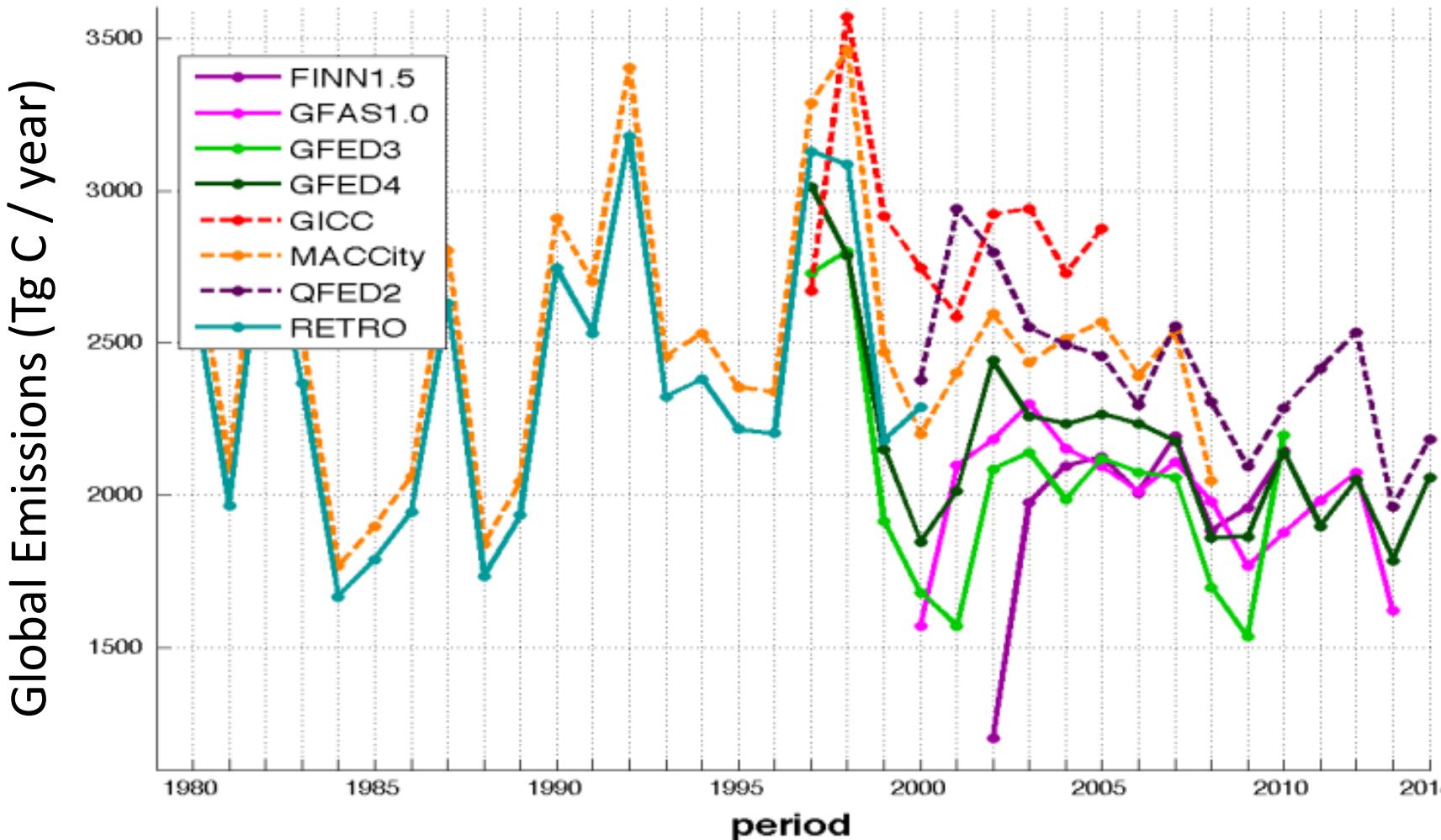
- MODIS Burned Area Products
 - <http://modis-fire.umd.edu/pages/BurnedArea.php>
- USFS Burned Area Emergency Response (BAER)
 - <https://www.fs.fed.us/eng/rsac/baer/>
- Monitoring Trends in Burn Severity (MTBS)
 - <http://www.mtbs.gov/>

Vegetation

- Global
 - MODIS Datasets Land Cover Type
 - Vegetation Continuous Fields
 - USGS 30m Land Cover
 - <https://landcover.usgs.gov/glc/>
 - Tree cover
 - Global Land Cover, <http://www.globallandcover.com/GLC30Download/index.aspx>
 - ESA 200m Annual Land Cover (1992-2015)
 - <https://www.esa-landcover-cci.org/?q=node/175>

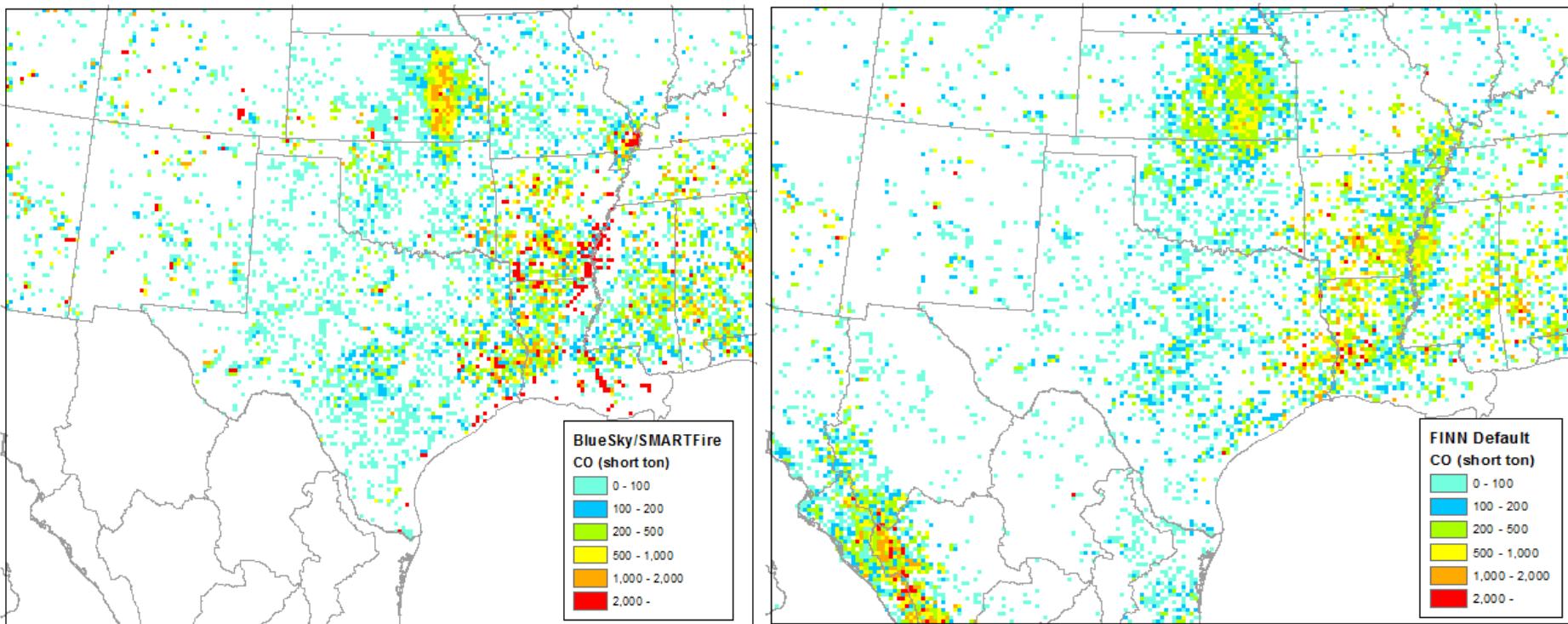
Uncertainties in Emission Estimates

Uncertainties in the emission models

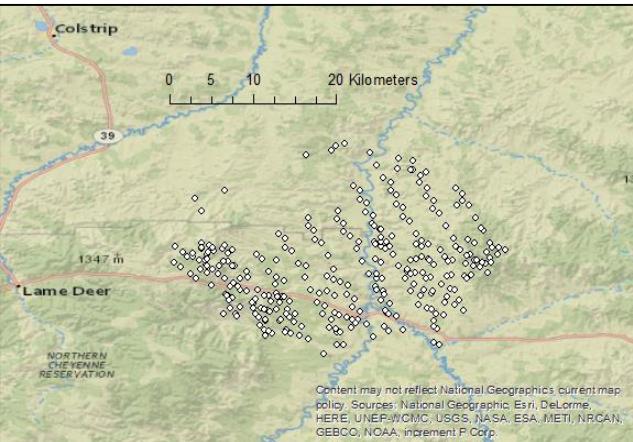


Uncertainties in the emissions

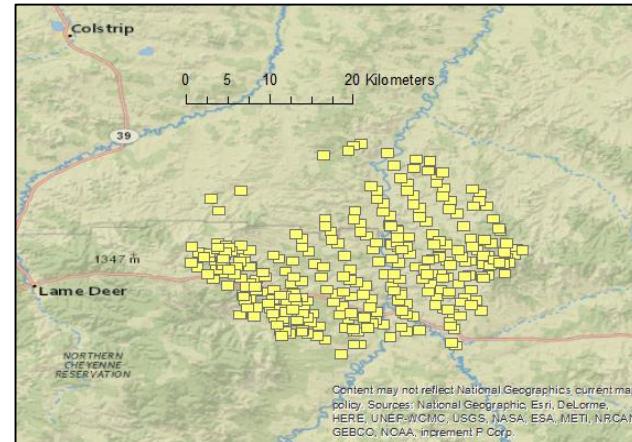
- Emission Factors
- Fire location/timing
- Fuel loadings
- Fuel Consumption



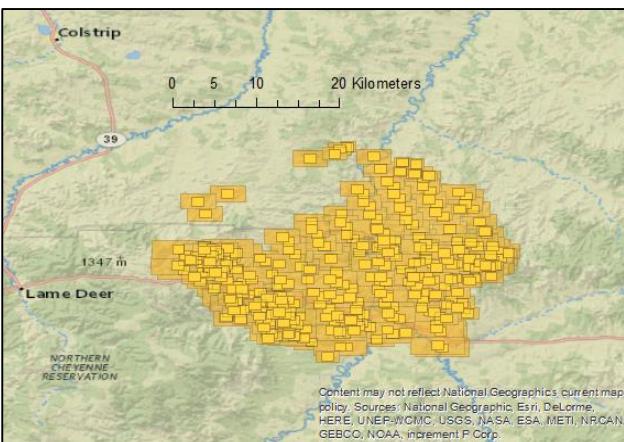
FINNv2: *Updates in Progress*



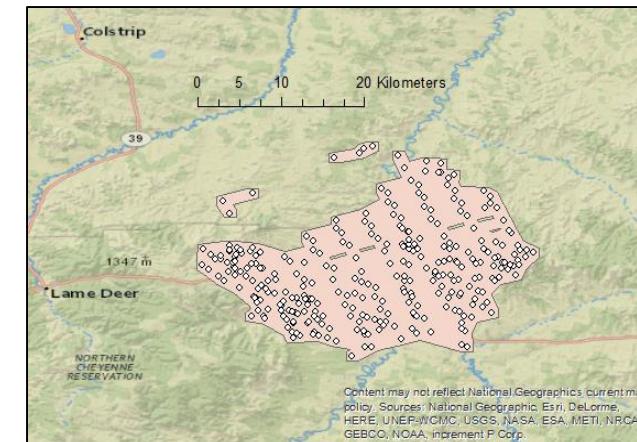
MODIS fire detections



1-km² area per detection



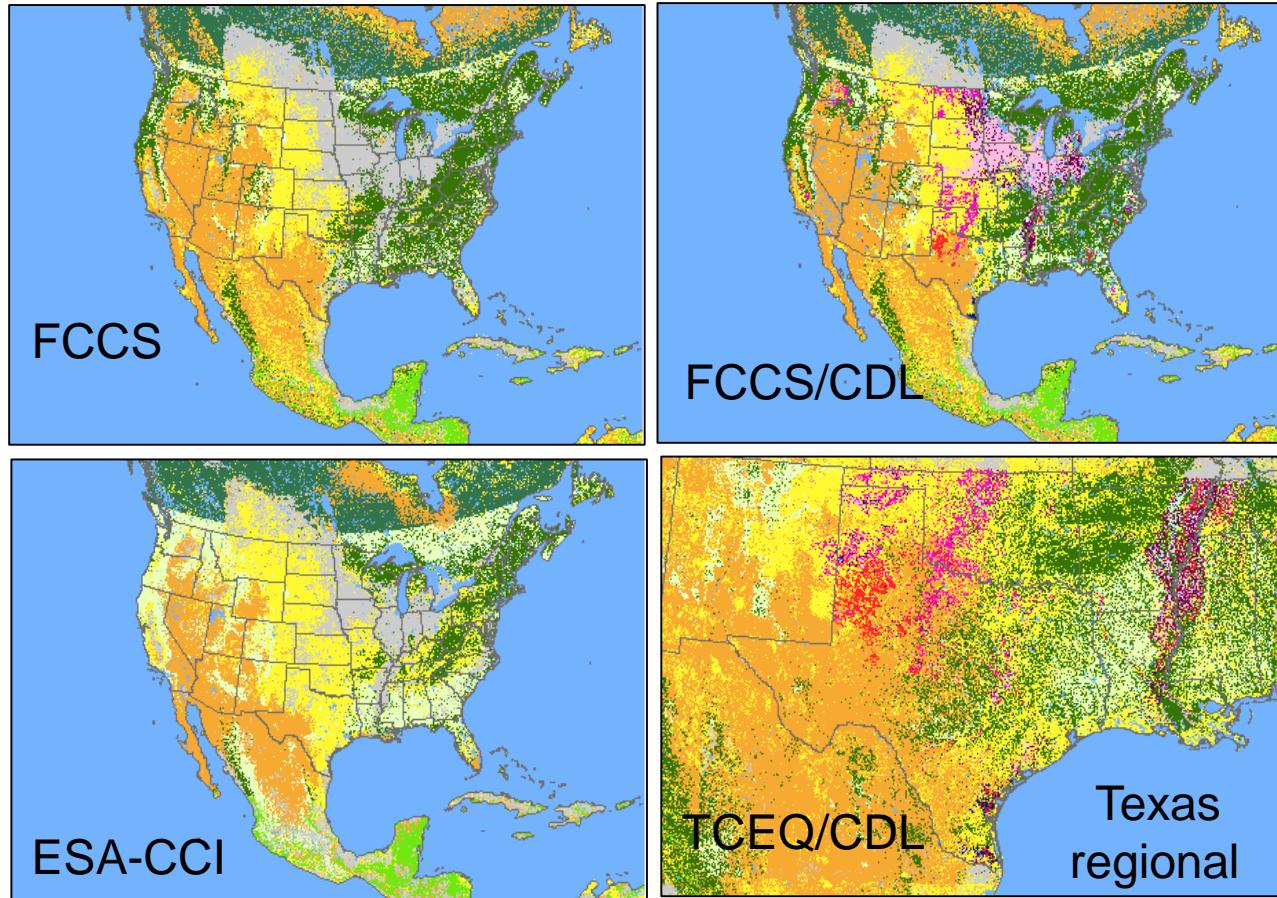
110% of easterly and northerly dimensions of satellite scan and track sizes identifies detection cluster.



Polygon formed from convex hulls of clusters of detections for burned area.

FINNv2: *Updates in Progress*

Comparing impacts from land cover inputs



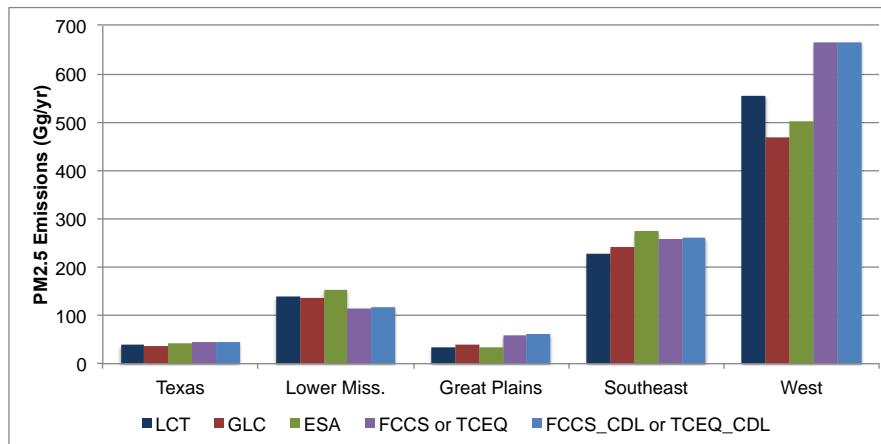
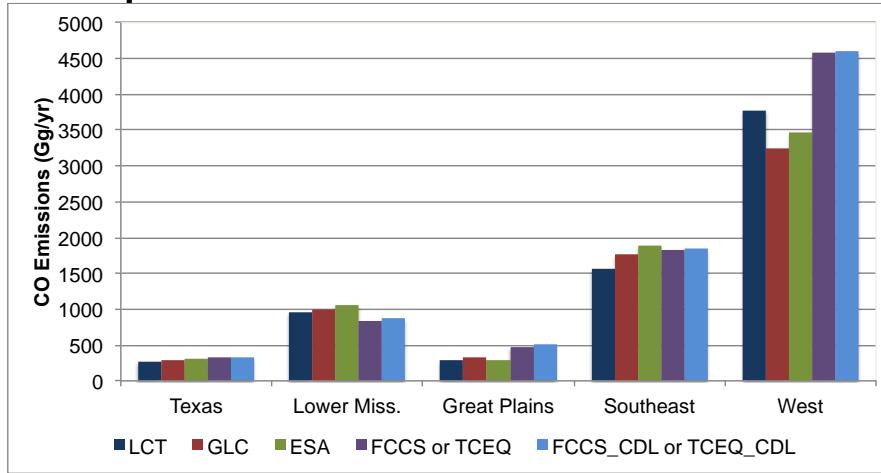
FINNv2: *Updates in Progress*

- Comparing impacts from land cover inputs

Annual regional total CO and PM_{2.5} emissions during 2012 from FINN v.2.1.

Land cover influences assignments of emission factors and fuel loadings.

Specification of crops captures seasonal activity but with little effect on total emissions



*TCEQ regional land cover includes only Texas and the Lower Mississippi Valley (Louisiana, Mississippi, Arkansas). FCCS for CONUS and MODIS LCT applied elsewhere.

What's needed for forecasting?

Depends on...

- What scales are you looking at?
- Where in the world are you looking?
- What do you want to know?

Forecasting

- Fuels and Fire Danger in the US
 - https://www.predictiveservices.nifc.gov/fuels_fire-danger/fuels_fire-danger.htm
- NOAA Hazard Mapping System
 - <http://www.ospo.noaa.gov/Products/land/hms.html>
- Naval Research Laboratory
 - <https://www.nrlmry.navy.mil/aerosol/>
 - Includes FLAMBE emissions and forecasts
- GEOMAC
 - <https://www.geomac.gov/viewer/viewer.shtml>

