



Introduction to Satellite Data Used as a Tool to Investigate our Dynamic Earth

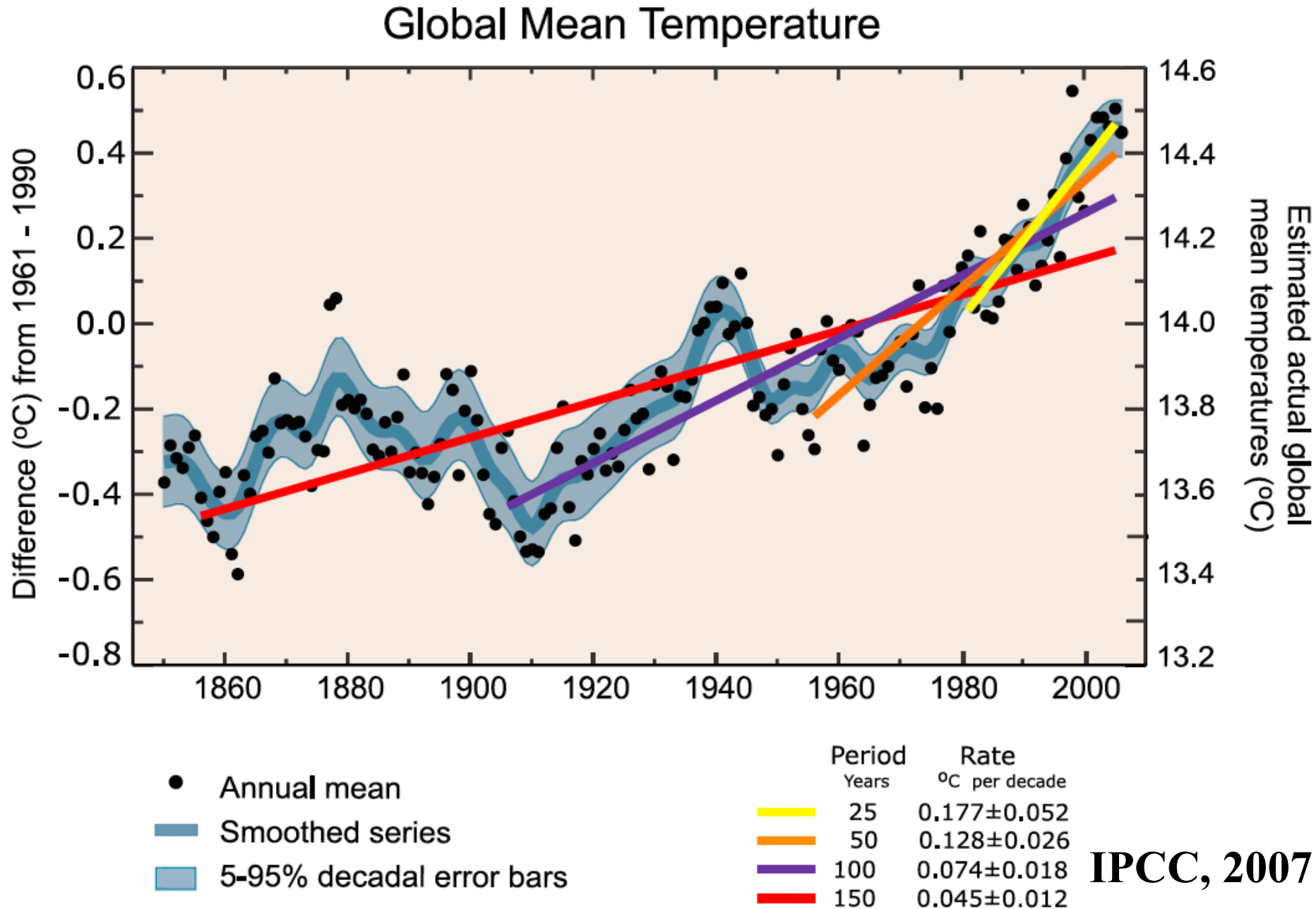
Amber Soja: amber.j.soja@nasa.gov

National Institute of Aerospace

Resident at NASA Langley Research Center

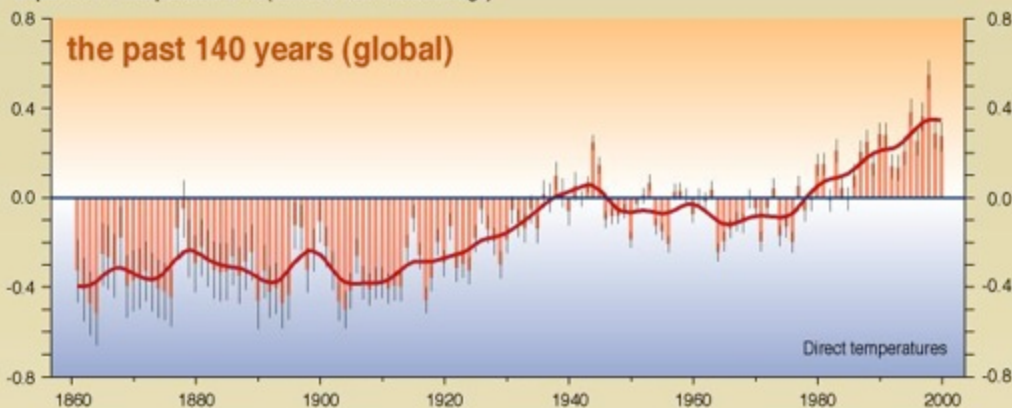
(757) 864 5603

Global surface temperature change 1850-2005

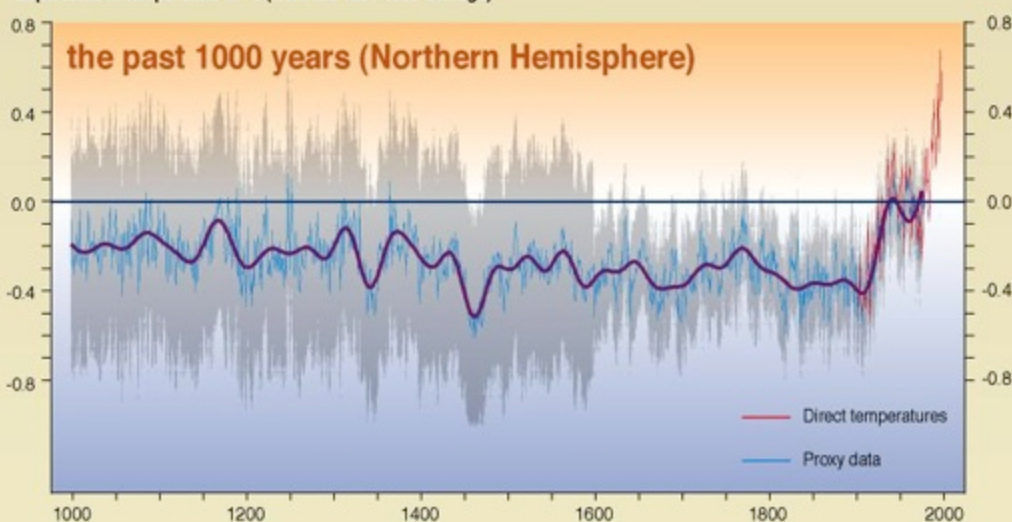


Variations of the Earth's surface temperature for...

Departures in temperature in °C (from the 1961-1990 average)



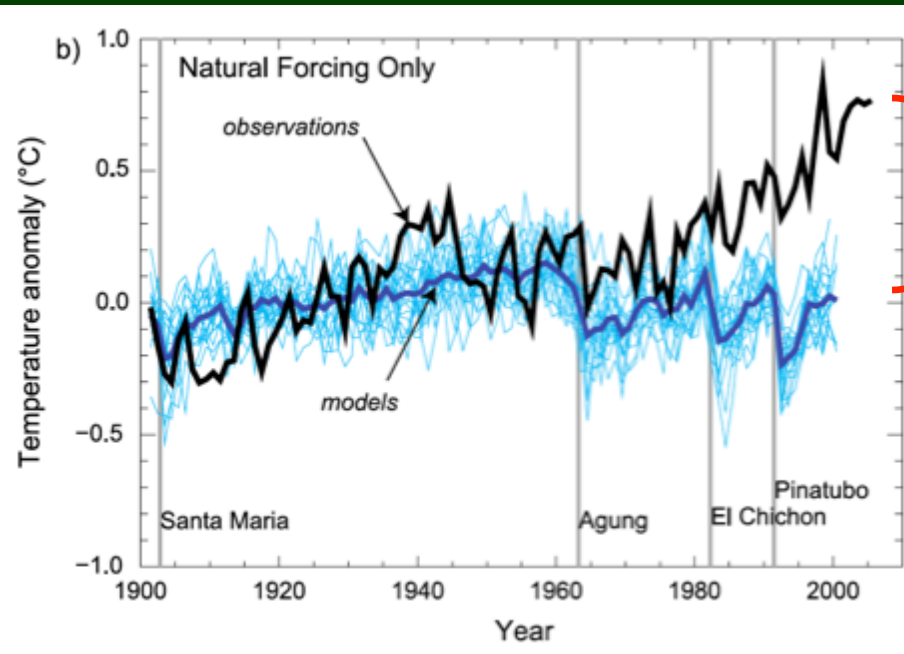
Departures in temperature in °C (from the 1961-1990 average)



SYR - FIGURE 2-3

Average world surface temperature is increasing.

What do physical climate models predict?

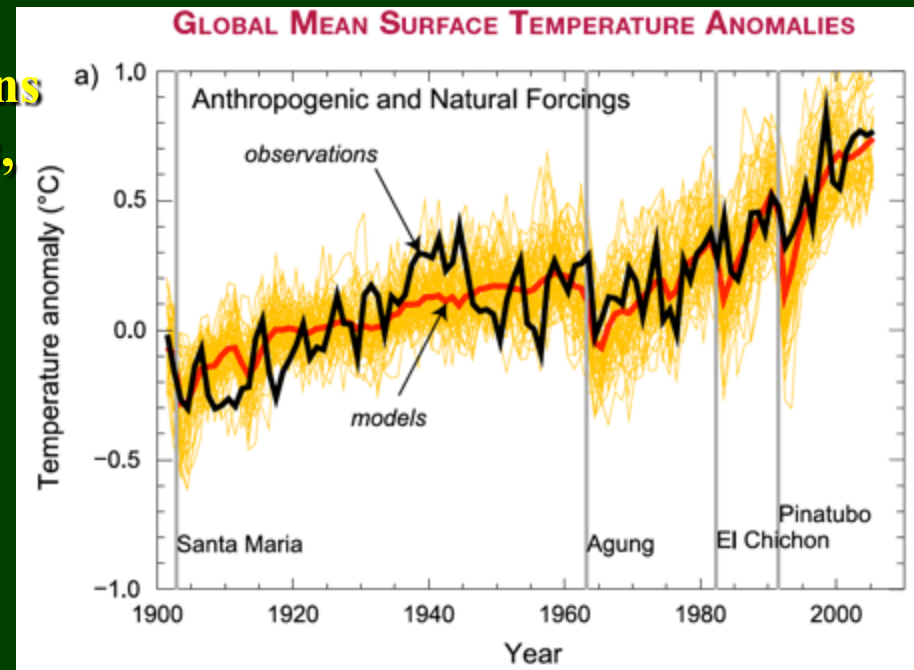


*Natural
Forcings
Cannot Explain
Observations*

IPCC, 2007

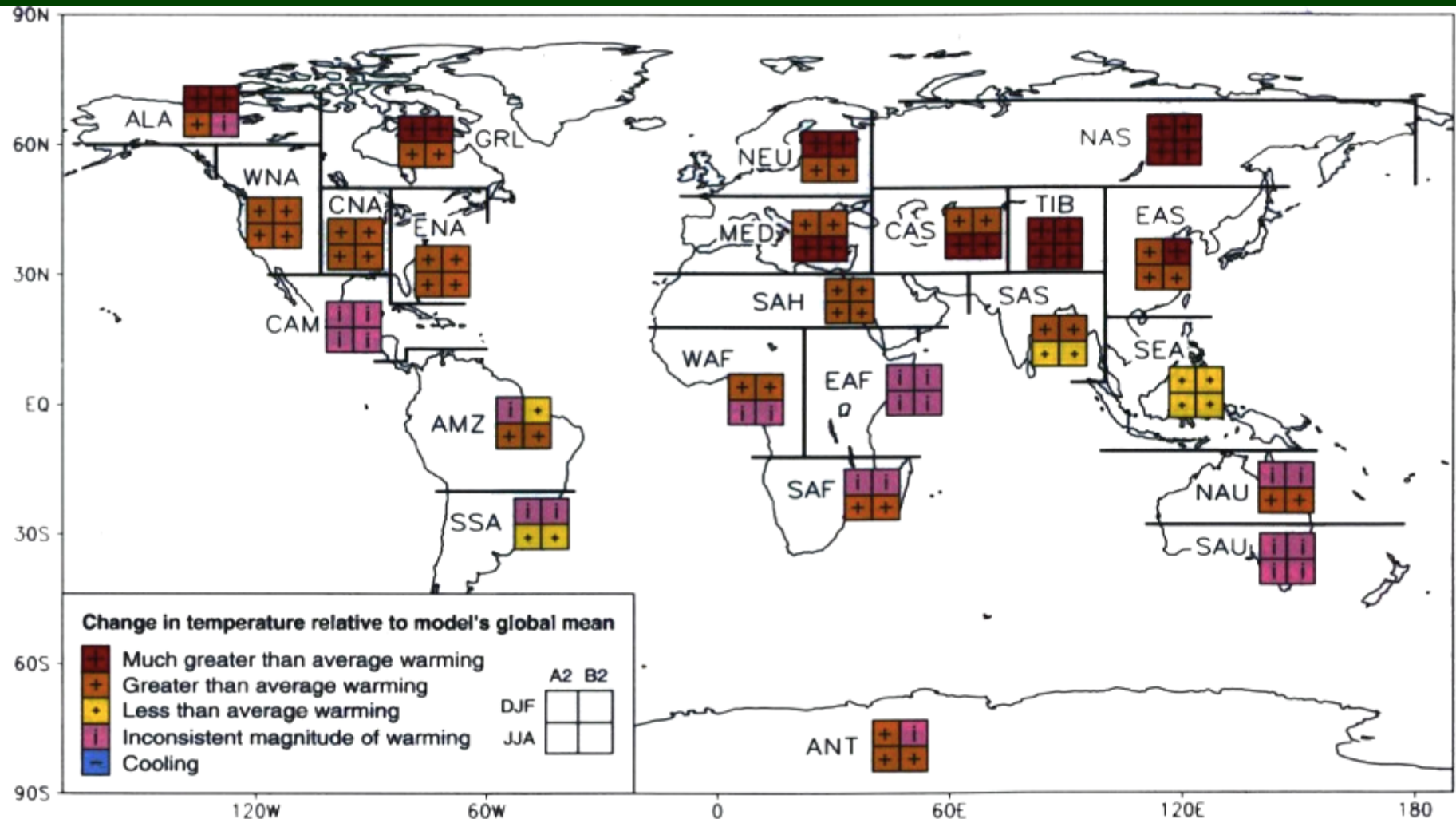
Natural Forcings: Solar, Volcanic Eruptions
**Human Forcings: CO₂, Methane, Aerosols,
Ozone, Land Cover Change**

*Natural Forcings And
Human Forcings Do Explain
Observations*

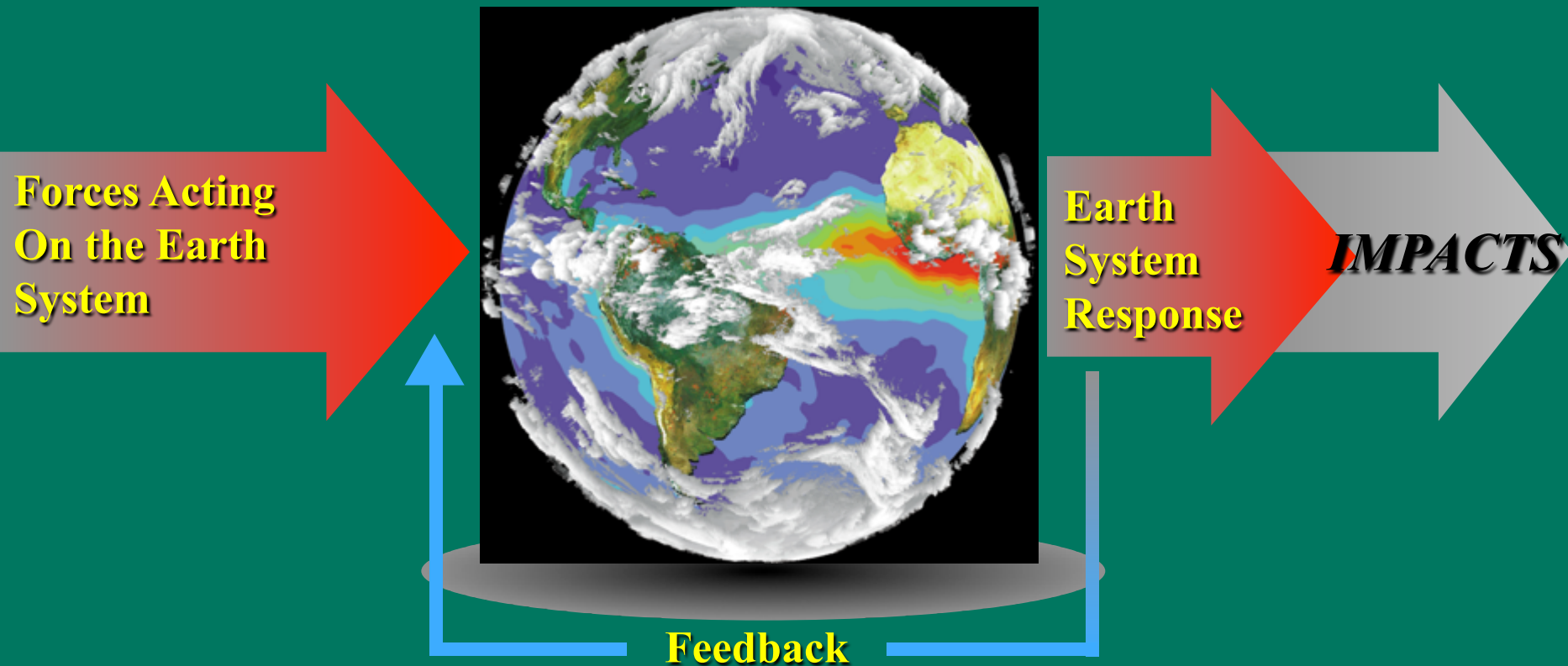


Analysis of Inter-model Consistency in Regional Warming

Atmospheric-Ocean General Circulation Models (AOGCM) are in agreement that warming in Northern Eurasia could be in excess of 40% above the global average (at least 7 of 9 models) (IPCC, 2001).



How does the Earth Respond?

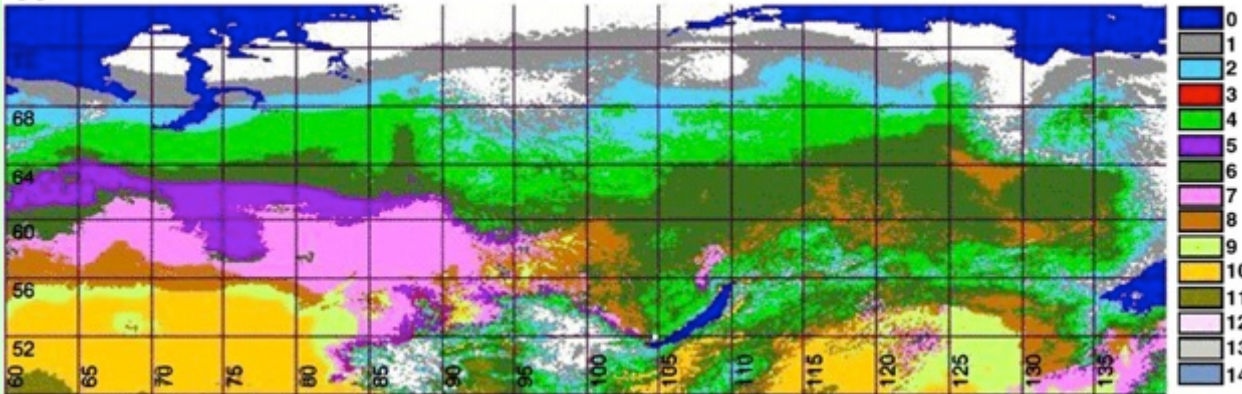


Of the total forcing of the climate system, 40% is due to the direct effect of greenhouse gases and aerosols, and 60% is from feedback effects, such as increasing concentrations of water vapor as temperature rises and changes in land surface albedo (reflectance).

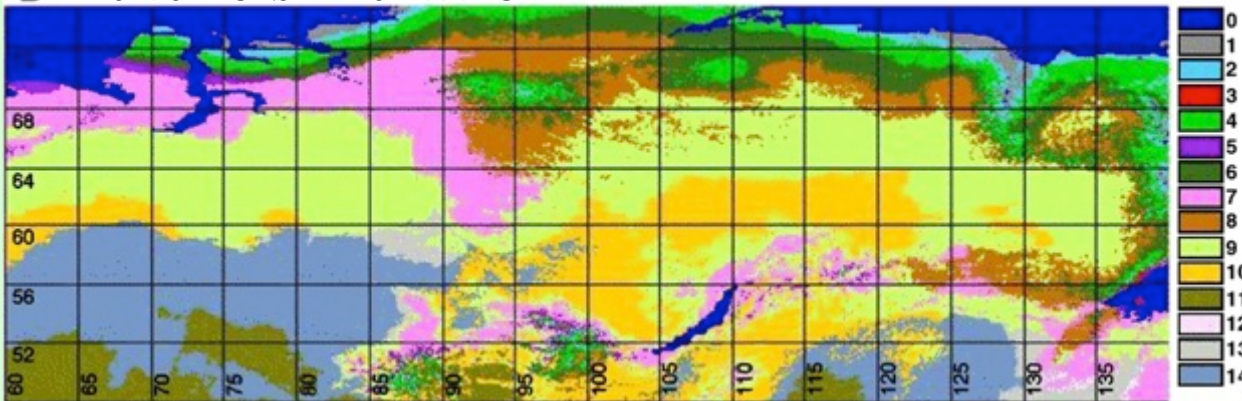
Siberia BioClimatic Model

It is predicted the taiga will largely be replaced by steppe and forest-steppe ecosystems in Siberia.

A Current simulation



B Future simulation



Vegetation distribution in Siberia: (A) current and (B) future (2100) based on a Hadley scenario (HadCM3GGal) (IPCC, 1996). Water (0), tundra (1), forest-tundra (2), northern dark taiga (3) and light taiga (4), middle dark taiga (5) and light taiga (6), southern dark taiga (7) and light taiga (8), forest-steppe (9), steppe (10), semidesert (11), broadleaved (12), temperate forest-steppe (13) and temperate steppe (14).

SiBCliM

Tchebakova and Parfenova

- There is already evidence of the migration of keystone ecosystems in the upland and lowland treeline of mountainous regions across southern Siberia (Soja et al., Global and Planetary change, 2007).

Climate and Weather

(temperature, precipitation, clouds, radiation)

Albedo Change
(ice and forest type)

Species and Forest
Composition

Growing Season
Length

Fire Season
Length

Ignitions from
Lightning

Fuel Moisture

Fire Weather
Severity

Fire

Infestation

Human Management

Soil Moisture /
Permafrost

Vegetation Cohort Change

Evapo-
transpiration

Carbon Balance

Aerosols and
Species-specific
Emissions

**Under the control of
weather and climate,
fire is a driving force
of change.**

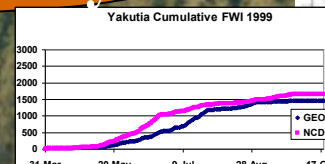
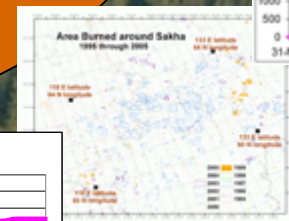
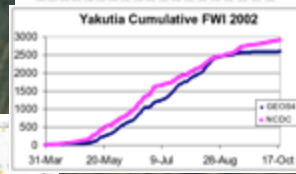
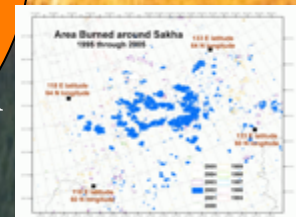
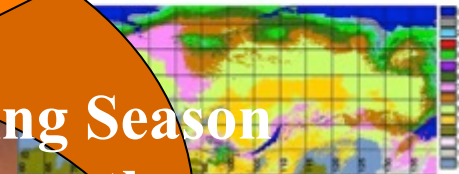
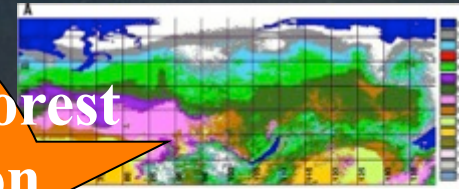
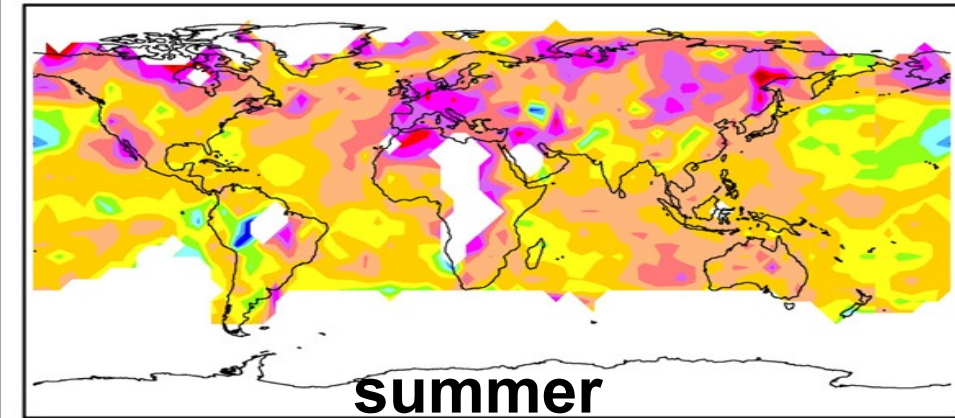
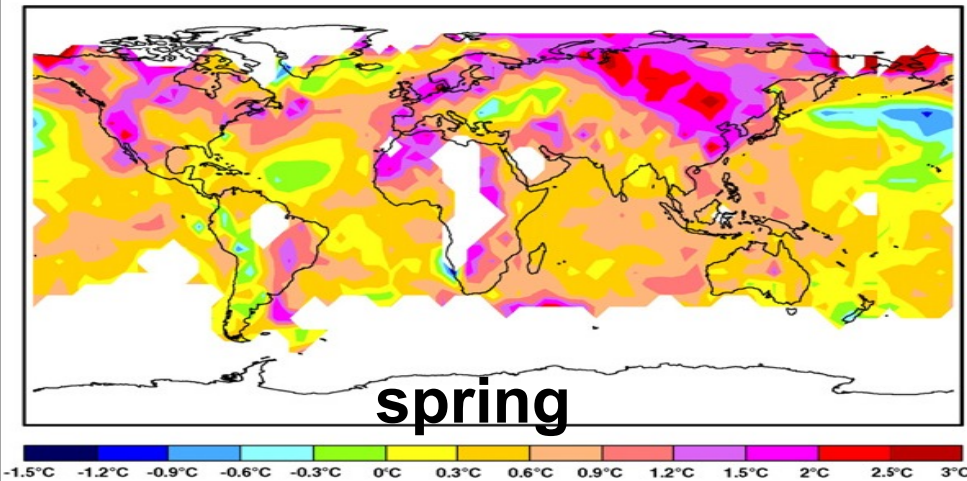
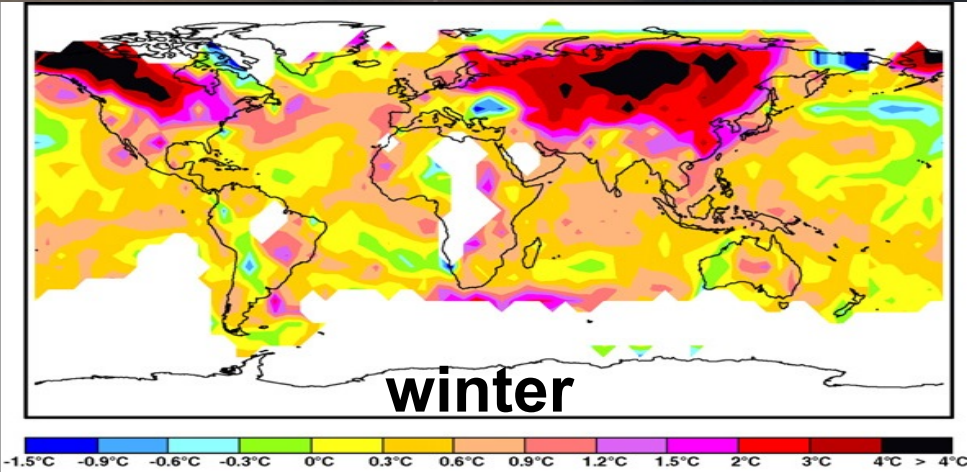


Photo:
Brian Stocks

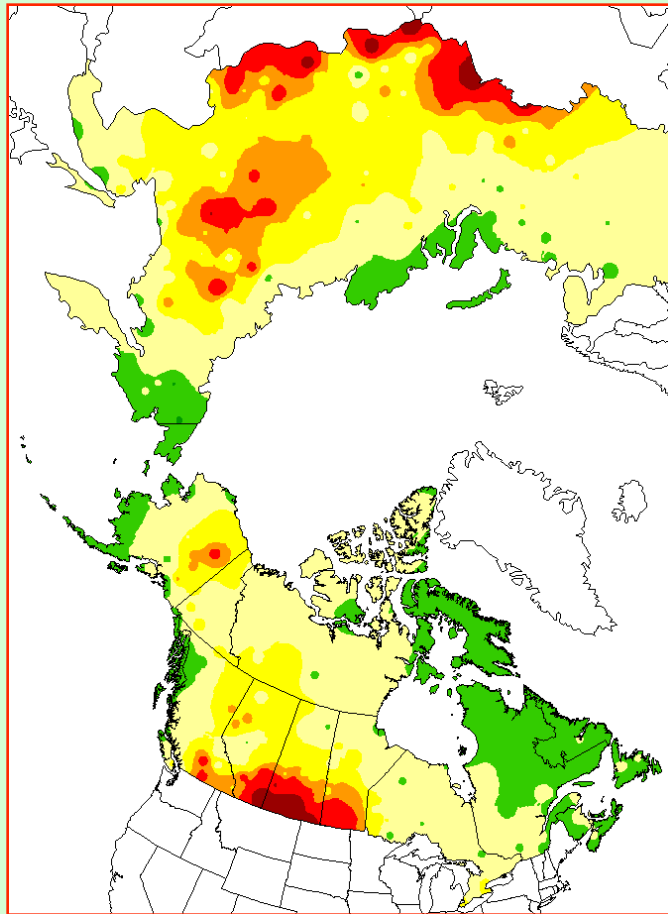


Mean seasonal temperature changes 1965 to 2004 .

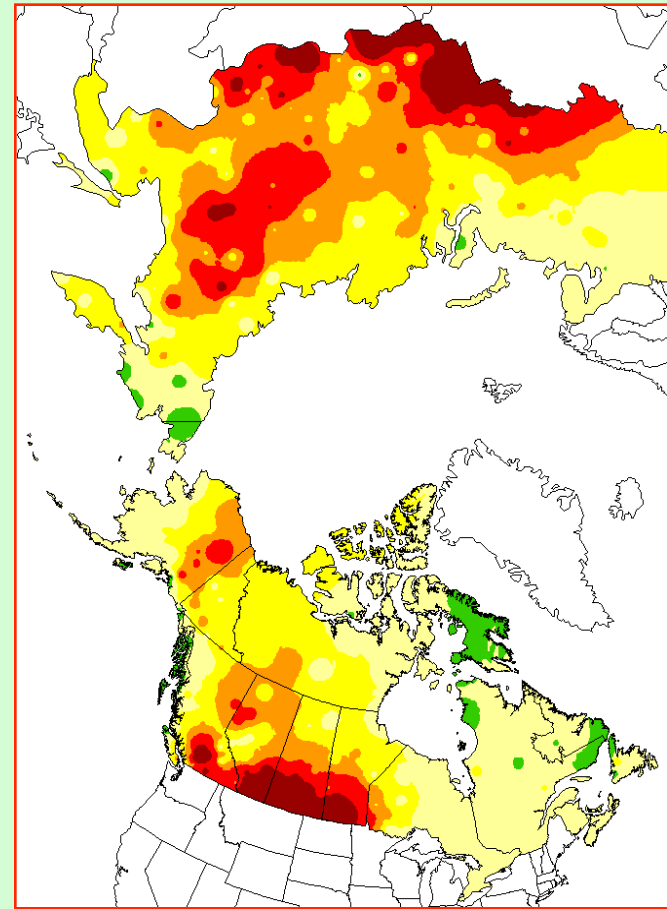
Temperatures are increasing, particularly in the Northern Hemisphere winter and spring, which leads to longer growing seasons, increased potential evapotranspiration and extreme fire weather.

[Groisman et al., 2007; Jones and Moberg, 2003, updated]

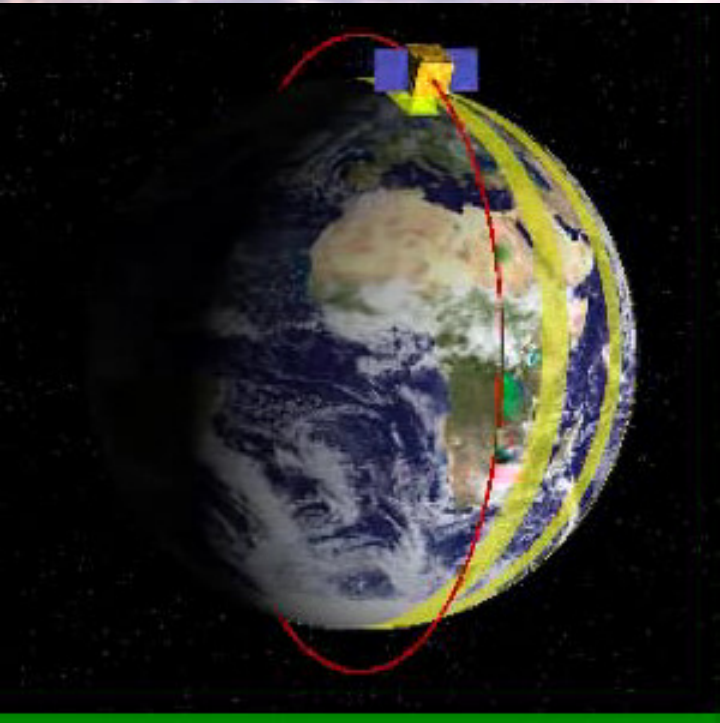
Role of Future Climate Change on Fire Weather



Historical Fire Weather

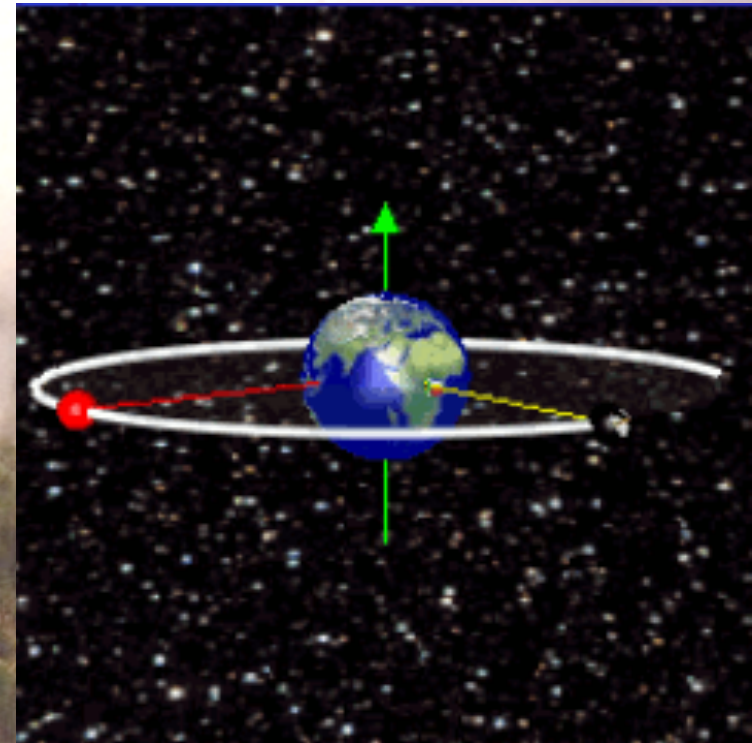


GCM: 2X CO₂
Stocks et al.

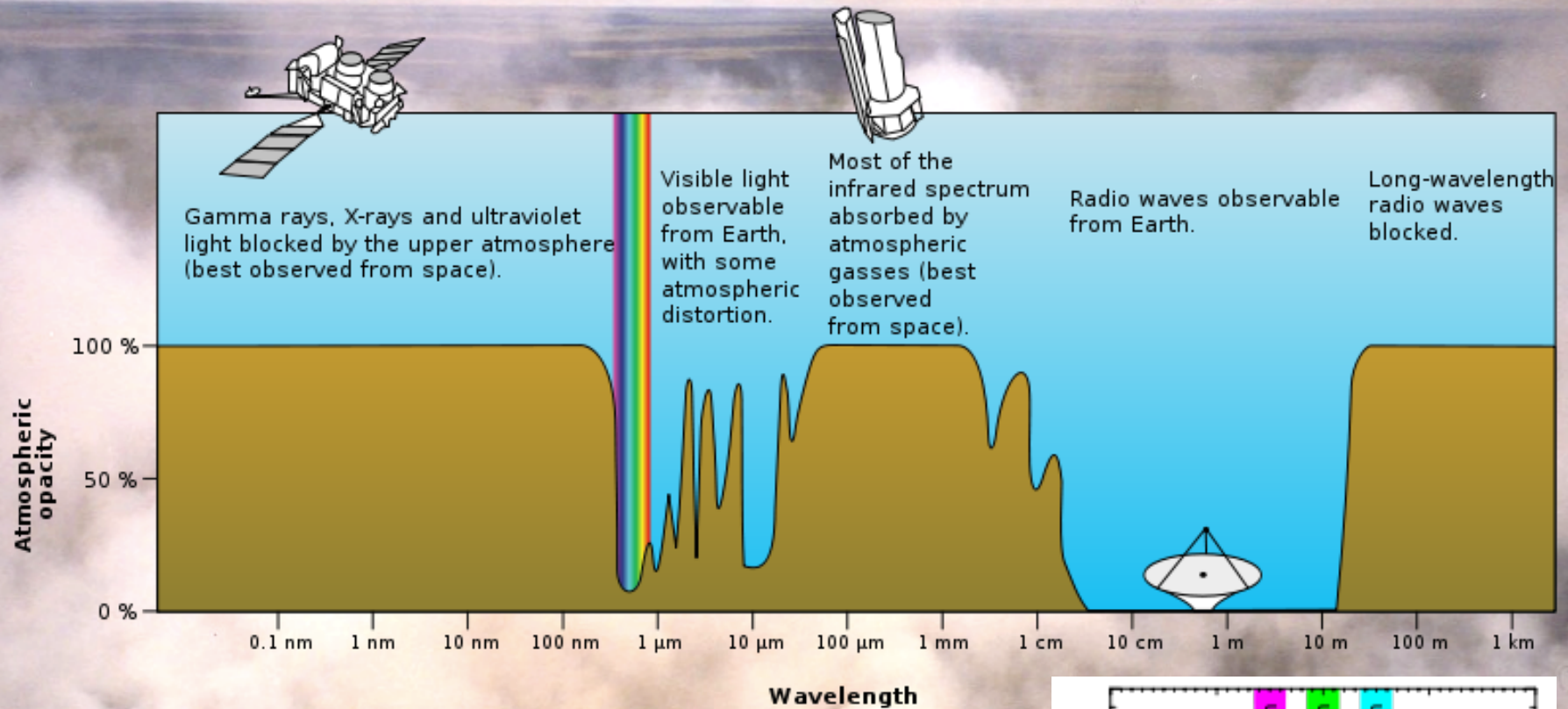


A polar **or sun** synchronous orbit is an orbit in which a satellite passes above or nearly above both poles on each revolution (one night-, one sun-side per revolution).

Geostationary orbits (also called geosynchronous or synchronous) are orbits in which the satellite is always positioned over the same spot on Earth.

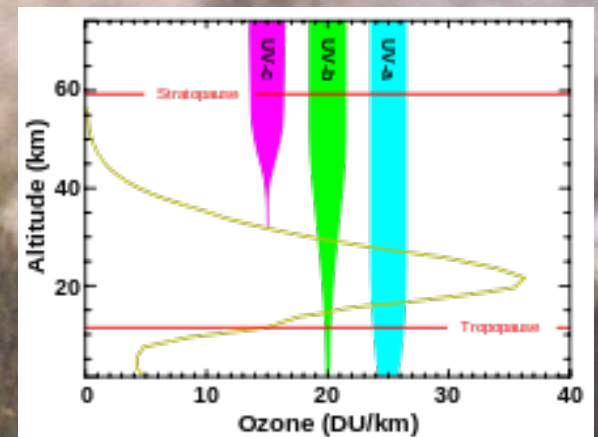


Earth's atmospheric transmittance (or opacity) to various wavelengths of electromagnetic radiation.



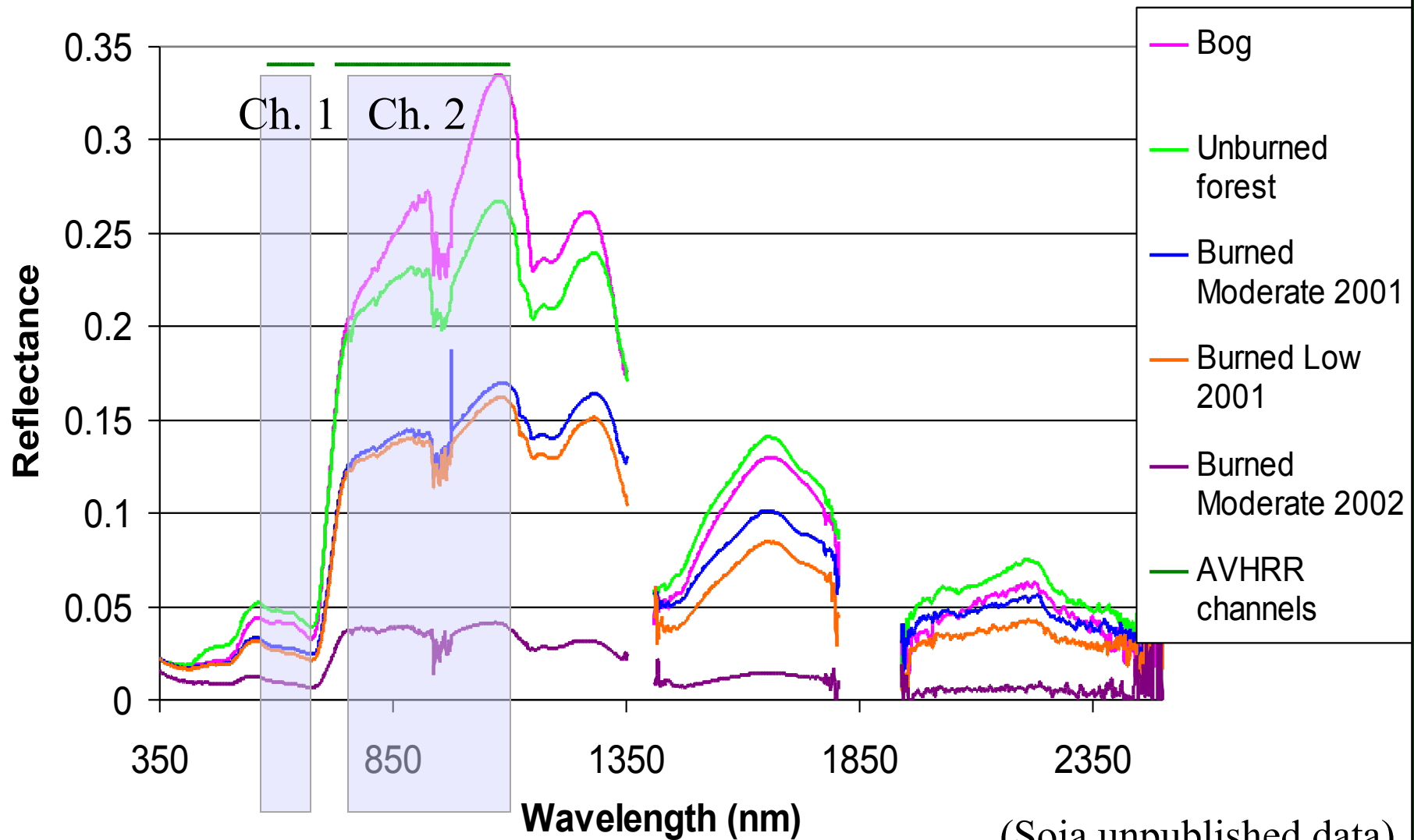
The amount of penetration of UV relative to altitude in Earth's ozone.

Figures taken from wikipedia.



Average Spectra from Helicopter: Yartsevo 2002

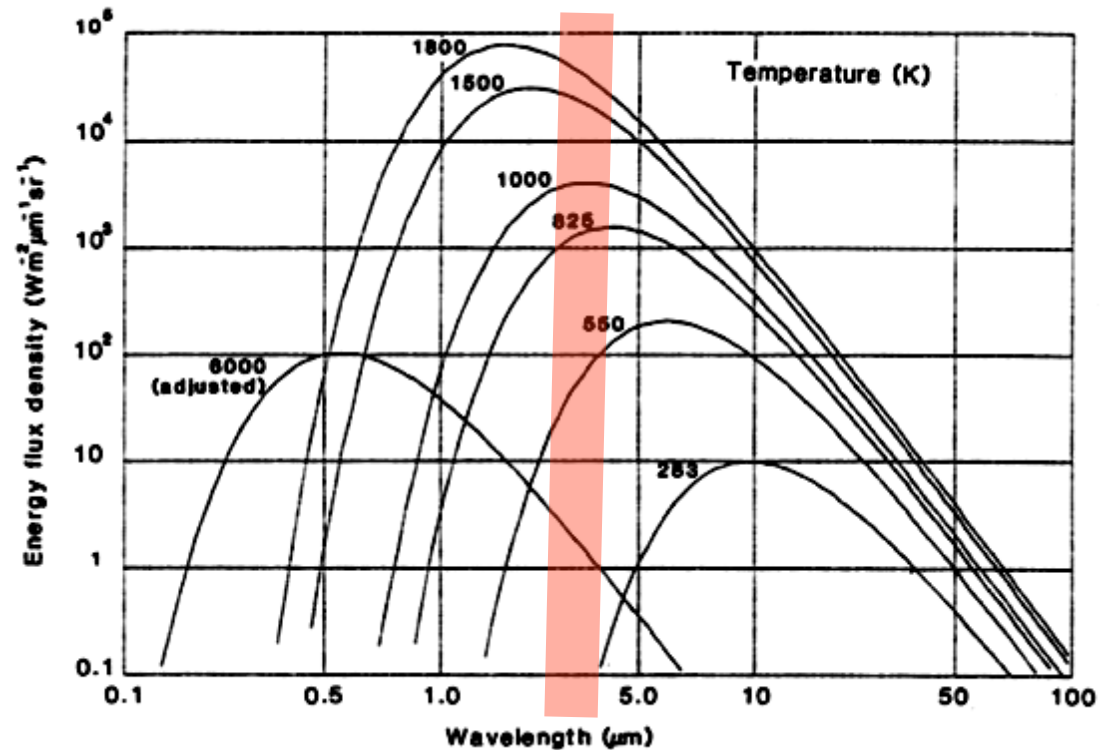
local time ~ 16:00 - 18:00, Field Of View 42m



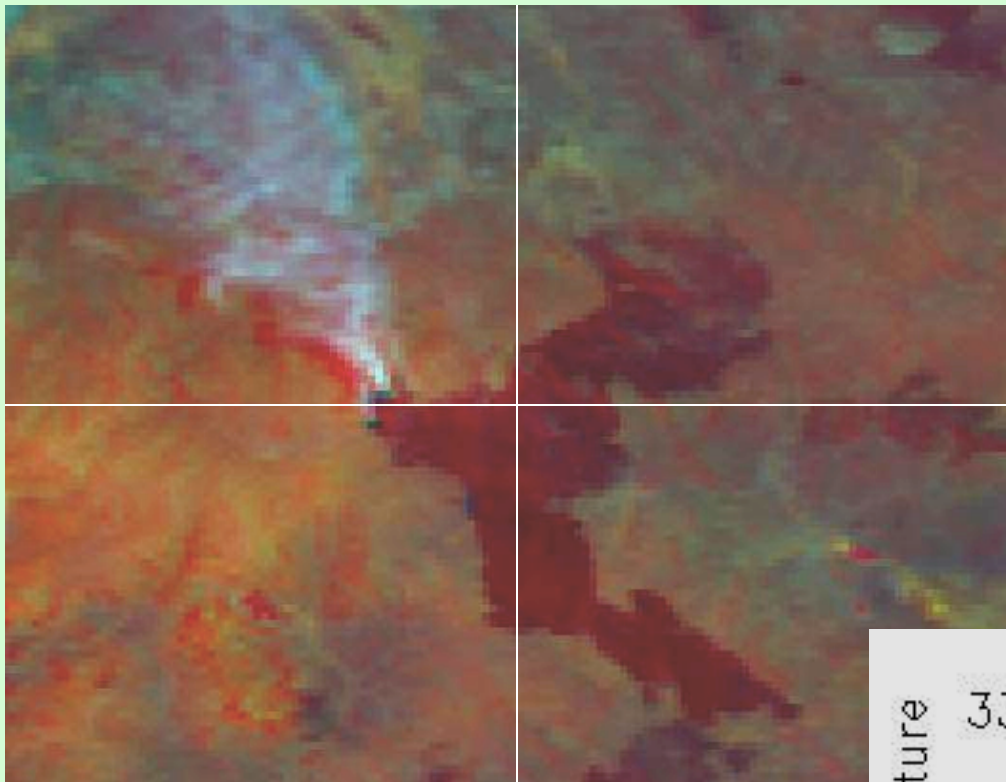
(Soja unpublished data)

Spectral Radiative Output of Black-body Objects.
Temperatures are based on Plank calculations and are representative of fires and Earth.

Red Highlight: Typical temperatures of fires
showing that both thermal and reflectance portions of the spectrum are relative to sensing fire from space.



The solar curve is based on 10% of solar energy reflected.
Figure copied from Robinson (1991).



Active Fire Detected by AVHRR channel 3 ($3.7 \mu\text{m}$)

Considerations

Clouds prohibit detection

Fire size? Fire intensity?

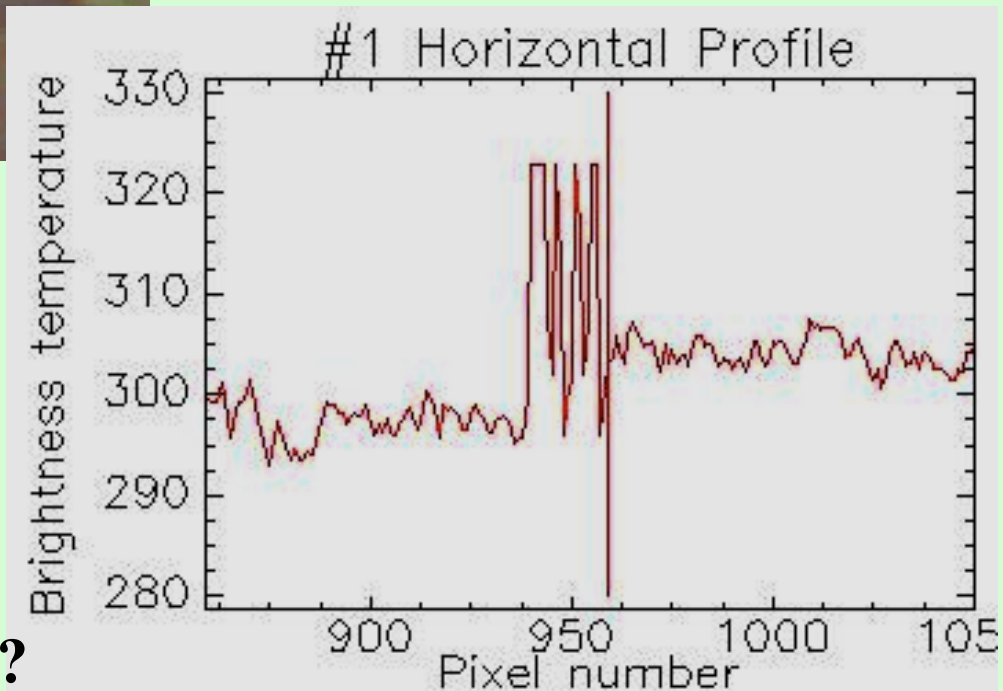
Viewing angle of satellite?

Point Response Function

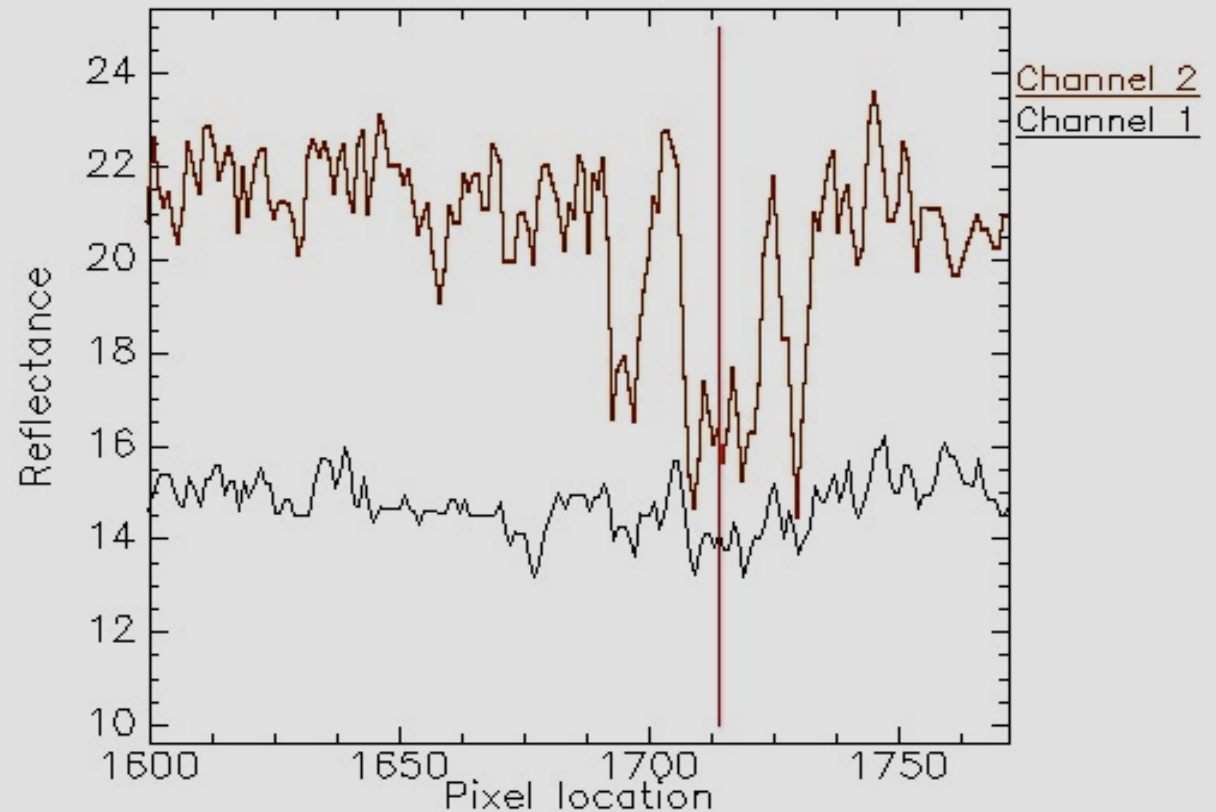
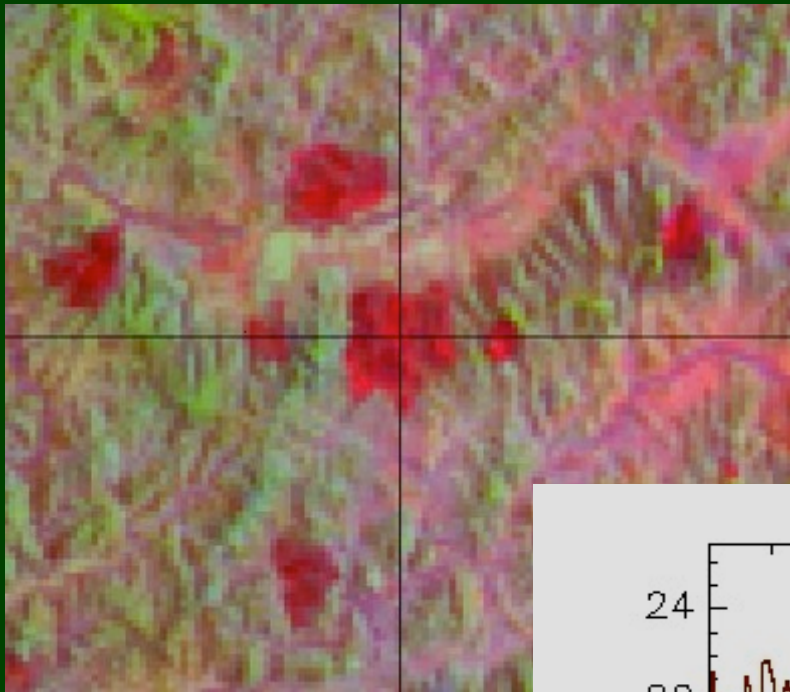
Instrument spatial resolution?

Instrument temporal resolution?

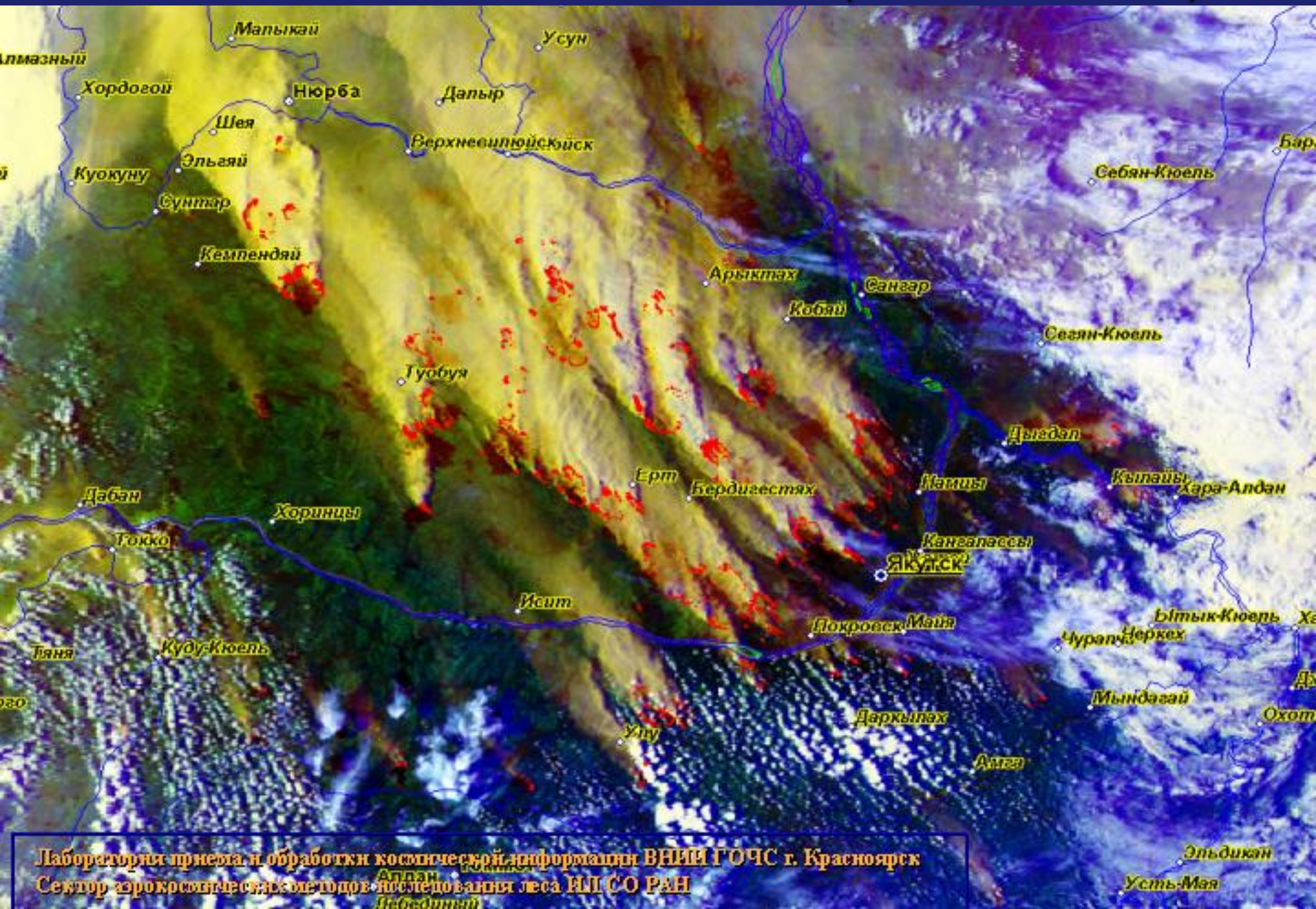
Instrument degradation? Data consistency



Identifying burn scars in AVHRR imagery



Smoke over Sakha 16.08.2002 (AVHRR data)



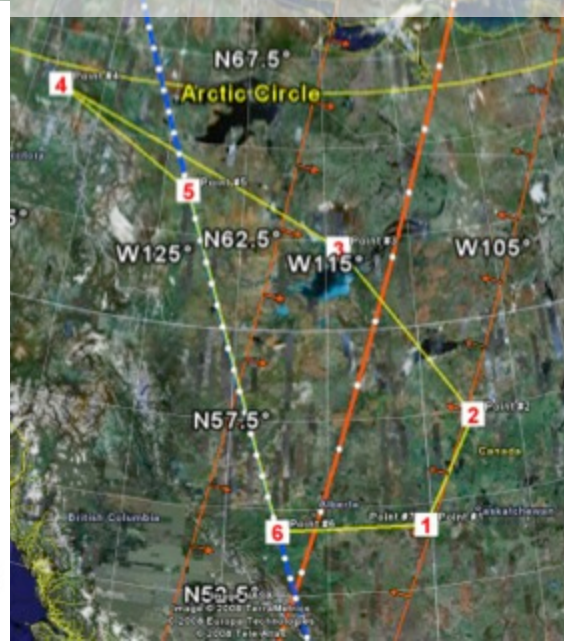
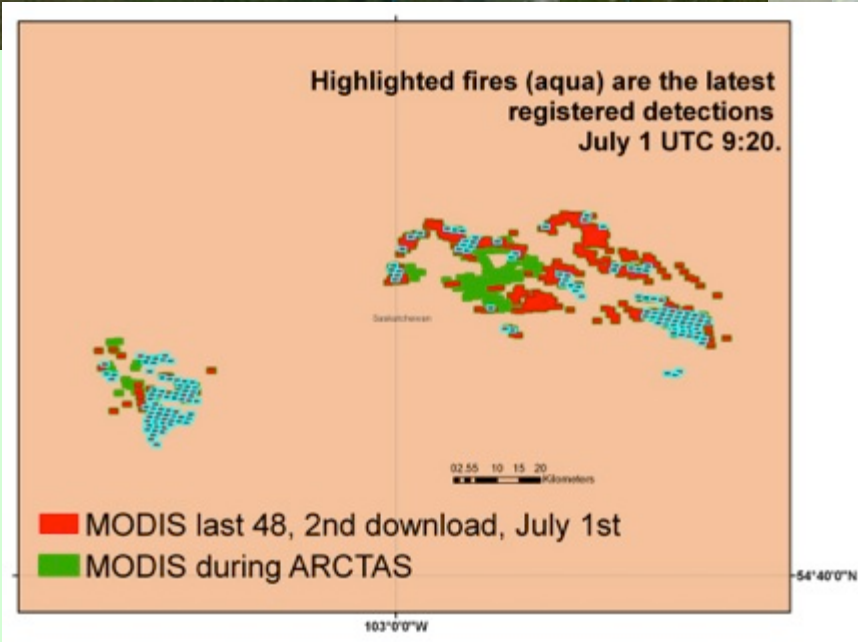
**Aqua 6/30/2008
19:50 UTC**



**Terra 6/30/2008
18:00 UTC**



Use of Satellite data during ARCTAS international airborne campaign



<http://earthdata.nasa.gov/data/near-real-time-data/rapid-response>

The screenshot shows a Mozilla Firefox browser window displaying the NASA Earth Data Website. The address bar shows the URL earthdata.nasa.gov/data/near-real-time-data/rapid-response. The page features the NASA logo and the text "National Aeronautics and Space Administration" and "EOSDIS NASA's Earth Observing System Data and Information System". The main navigation bar includes links for Home, About EOSDIS, Data, Our Community, User Resources, and Labs. The "Data" section is expanded, showing links for Discovering Data, Data Centers, Data Tools, Near Real-Time Data, and References. The "Near Real-Time Data" section is further expanded, showing links for Data Products, Rapid Response, Hazards and Disasters, MODIS Subsets, MODIS Near Real Time (Orbit Swath) Images, Gallery, Antarctica Mosaic, Arctic Mosaic, MODIS Global Fire Maps, About Rapid Response Imagery, and User Applications. The "Rapid Response" section is highlighted, and its description is shown: "The Rapid Response system provides a variety of imagery for certain products from the MODIS, AIRS, and OMI instruments. Imagery for approximately 40 products from the three instruments are available and are organized into 14 application categories to assist users in monitoring and analyzing a variety of natural and man-made Hazards and Disasters (e.g. ash plumes and fires). The traditional MODIS Subsets and MODIS Near Real Time (Orbit Swath) Images continue to be available. Additional information may be found at About Rapid Response Imagery." Below this, the "Hazards and Disasters" section is expanded, showing a description: "Subsets of 40 products from MODIS, AIRS, and OMI are available for a variety of hazards and disasters categories selected by the users. The imagery is available through a geographic or polar coordinate system Web Mapping Service client. NOTE: The WMS client currently does not work with Internet Explorer." A small thumbnail image of a satellite view of a coastal area is also visible.

Rapid Response

The Rapid Response system provides a variety of imagery for certain products from the MODIS, AIRS, and OMI instruments. Imagery for approximately 40 products from the three instruments are available and are organized into 14 application categories to assist users in monitoring and analyzing a variety of natural and man-made Hazards and Disasters (e.g. ash plumes and fires). The traditional MODIS Subsets and MODIS Near Real Time (Orbit Swath) Images continue to be available. Additional information may be found at About Rapid Response Imagery.

Hazards and Disasters

Subsets of 40 products from MODIS, AIRS, and OMI are available for a variety of hazards and disasters categories selected by the users. The imagery is available through a geographic or polar coordinate system Web Mapping Service client. NOTE: The WMS client currently does not work with Internet Explorer.

MODIS Subsets

One must read the product and data descriptions.

MODIS Rapid Response –

<http://rapidfire.sci.gsfc.nasa.gov/realtime/>

Rapid Response - LANCE - Near Real Time (Orbit Swath) Images - Mozilla Firefox

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LandSat Science - Data Rapid Response - LANCE - Near R... Rapid Response - LANCE - Near R...

rapidfire.sci.gsfc.nasa.gov/realtime

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NASA Earth Data Data Discovery Data Centers Community Science Disciplines Search EOSDIS

Near Real Time (Orbit Swath) Images

Date: 2012/176 - 06/24/2012

prev

Date: 06/24/2012 ☐ Display false-color with true-color ☐ Display resolution list [Usage Guidelines](#)

Terra/MODIS (View Terra Orbit Tracks)

12:05 UTC	10:25 UTC	08:45 UTC	07:10 UTC	05:30 UTC	03:50 UTC	02:10 UTC	00:30 UTC
							
12:10 UTC	10:30 UTC	08:50 UTC	07:15 UTC	05:35 UTC	03:55 UTC	02:15 UTC	00:35 UTC
							

Waiting for rapidfire.sci.gsfc.nasa.gov...

Images - Mozilla Firefox

Response - LANCE - Near R... +

Google

f No Savings Total Savings: \$168.39

		
04:10 UTC	02:30 UTC	00:50 UTC
		
04:15 UTC	02:35 UTC	00:55 UTC
		
04:20 UTC	02:40 UTC	01:00 UTC

Waiting for rapidfire.sci.gsfc.nasa.gov...

<http://earthdata.nasa.gov/data/nrt-data/firms/active-fire-data>

Active Fire Data | EOSDIS - Earth Data Website - Mozilla Firefox

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earthdata.nasa.gov/data/nrt-data/firms/active-fire-data

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EOSDIS NASA's Earth Observing System Data and Information System

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Discovering Data Data Centers Data Tools **Near Real-Time Data** References

Home > Data > Near Real-Time Data > FIRMS > Active Fire Data

Active Fire Data [Share/Send](#) [Print](#)

FIRMS

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- Active Fire Data**
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LANCE NEWS

- Terra MODIS Near Real-Time Data Loss 2012-06-06
- First SUOMI NPP Applied Sciences Workshop, June 21-22
- Terra MODIS Near Real-Time Data Loss 2012-05-11

SHP **KML** **WMS** **TXT** **Archive Download Tool** **Global Fire Maps**

SHP

Shape files of active fire data for the last 24 and 48 hours, and 7 days. For more information, please see the [SHP README \(PDF\)](#).



Alaska Canada Europe Russia and Asia

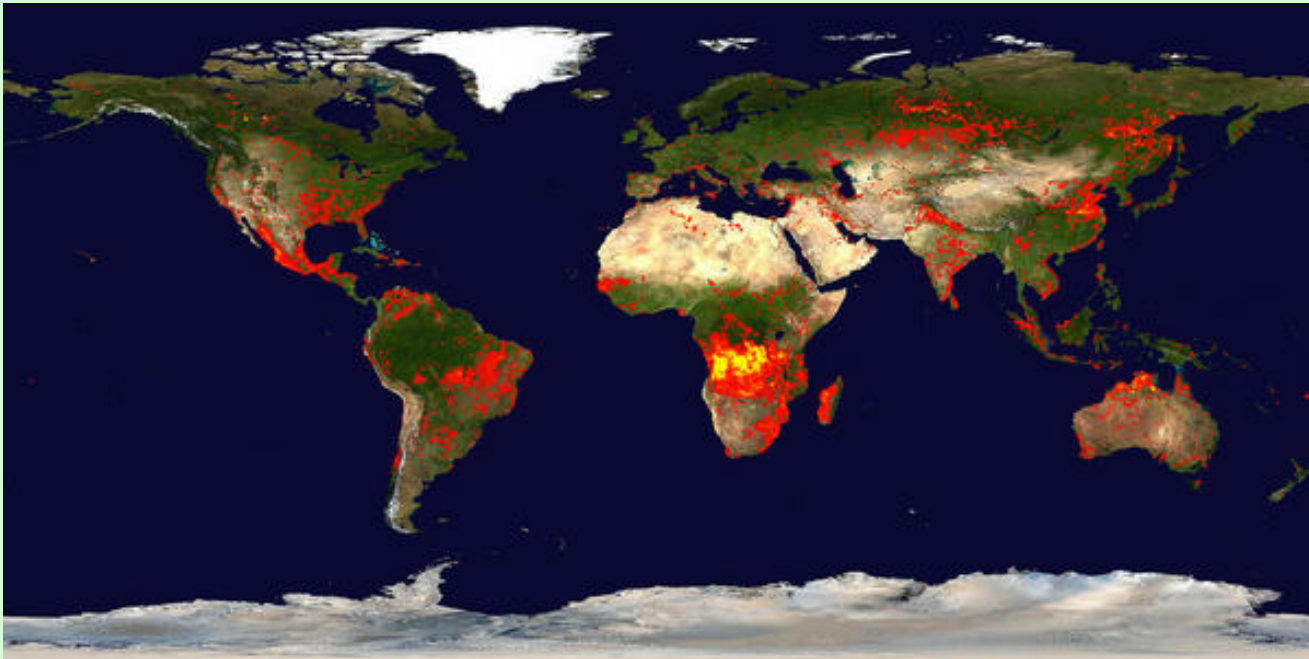
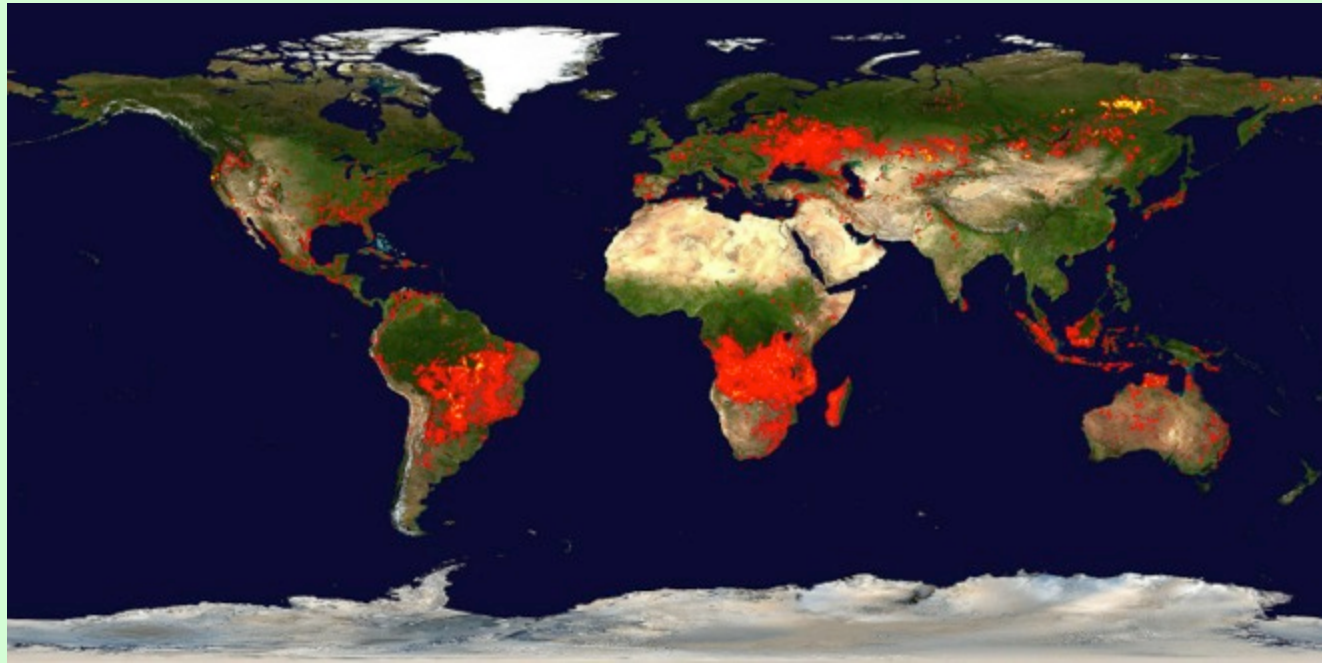
Conterminous USA and Hawaii Central America Northern and Central Africa South Asia South East Asia Southern Africa South America Australia and New Zealand

Feedback

Windows 7 Canon Solu... 7 Microsof... 4 Microsof... 2 Adobe R... 3 Firefox 2 Microsof... NASA_rapid...

Global Fire Pict
05/30/2012 -
06/08/2012

August 2002
Days 221-230



<http://eosweb.larc.nasa.gov/>

One MUST read the documentation

NASA Langley Atmospheric Science Data Center (Distributed Active Archive Center) - Mozilla Firefox

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Abstract: Using Nasa's ne... MODIS Products Table | P... Home

eosweb.larc.nasa.gov

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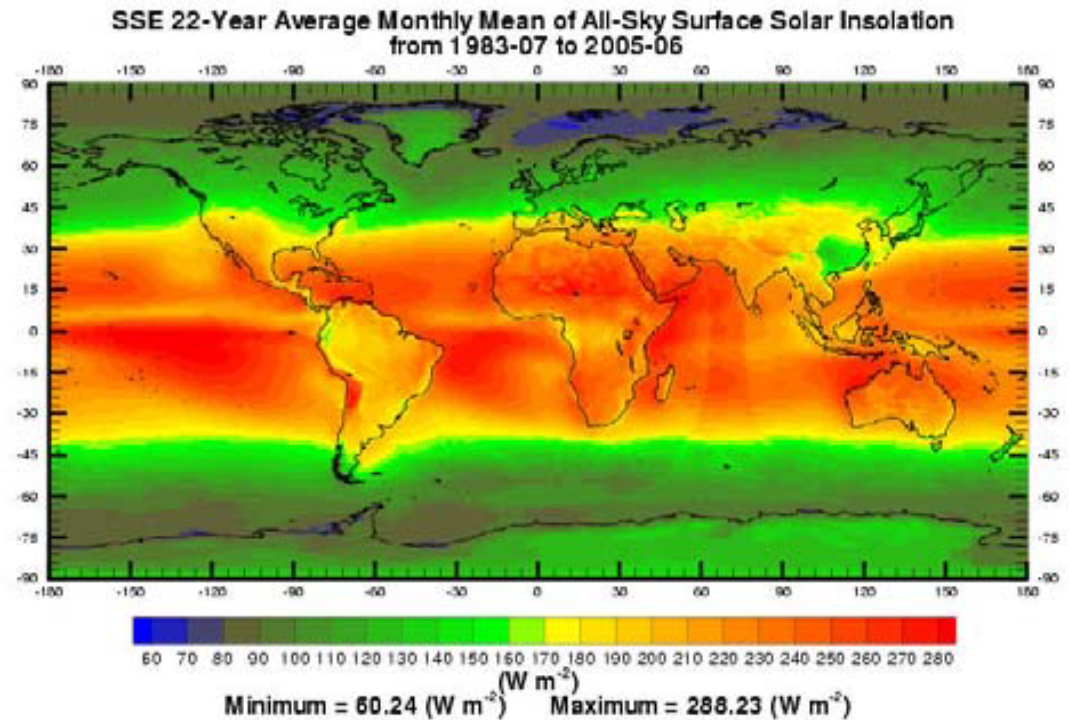
NASA Earth Data Data Discovery Data Centers

Atmospheric Science Data Center Processing, archi Center

The Atmospheric Science Data Center (ASDC) at NASA Langley Research Center provides processing, archiving, and distribution of NASA Earth science data in the area of aerosols, and tropospheric chemistry. The ASDC specializes in atmospheric data and processes of global climate change and the consequences of human activities.

Data and Tools

- Access Data by: [Description](#) | [Discipline](#) | [Project](#)
 - Documentation is included on project pages
- [Data Pool](#)
- [Order Tools and Help](#)
- [MISR Order Tool](#)
- [Reverb Search Tool](#)
- [Aerosol Measurement and Processing System \(AMAPS\)](#)
- [CALIPSO Search and Subset Tool \(Beta\)](#)
- [CERES Order Tool \(Beta\)](#)
- [Software Tools](#)
- [Data Product Citation](#)



2007-06-27

Solar Radiation Budget: 22-year average of the annual mean of surface solar insolation (July 1983- June 2005).

<http://ceres.larc.nasa.gov/index.php>

NASA CERES — Clouds and Earth's Radiant Energy System Information and Data - Mozilla Firefox

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USGS Global Visualization V... x USGS Global Visualization V... x Rapid Response - LANCE - ... x Rapid Response - LANCE - ... x NASA CERES — Clouds and... x +

ceres.larc.nasa.gov/index.php

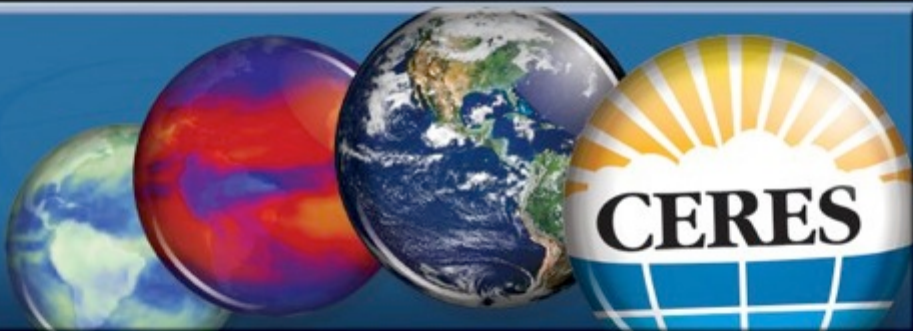
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 National Aeronautics and Space Administration

SEARCH CERES

Clouds and the Earth's Radiant Energy System



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Science Team Members

Clouds and Earth's Radiant Energy System (CERES)

Who are we?

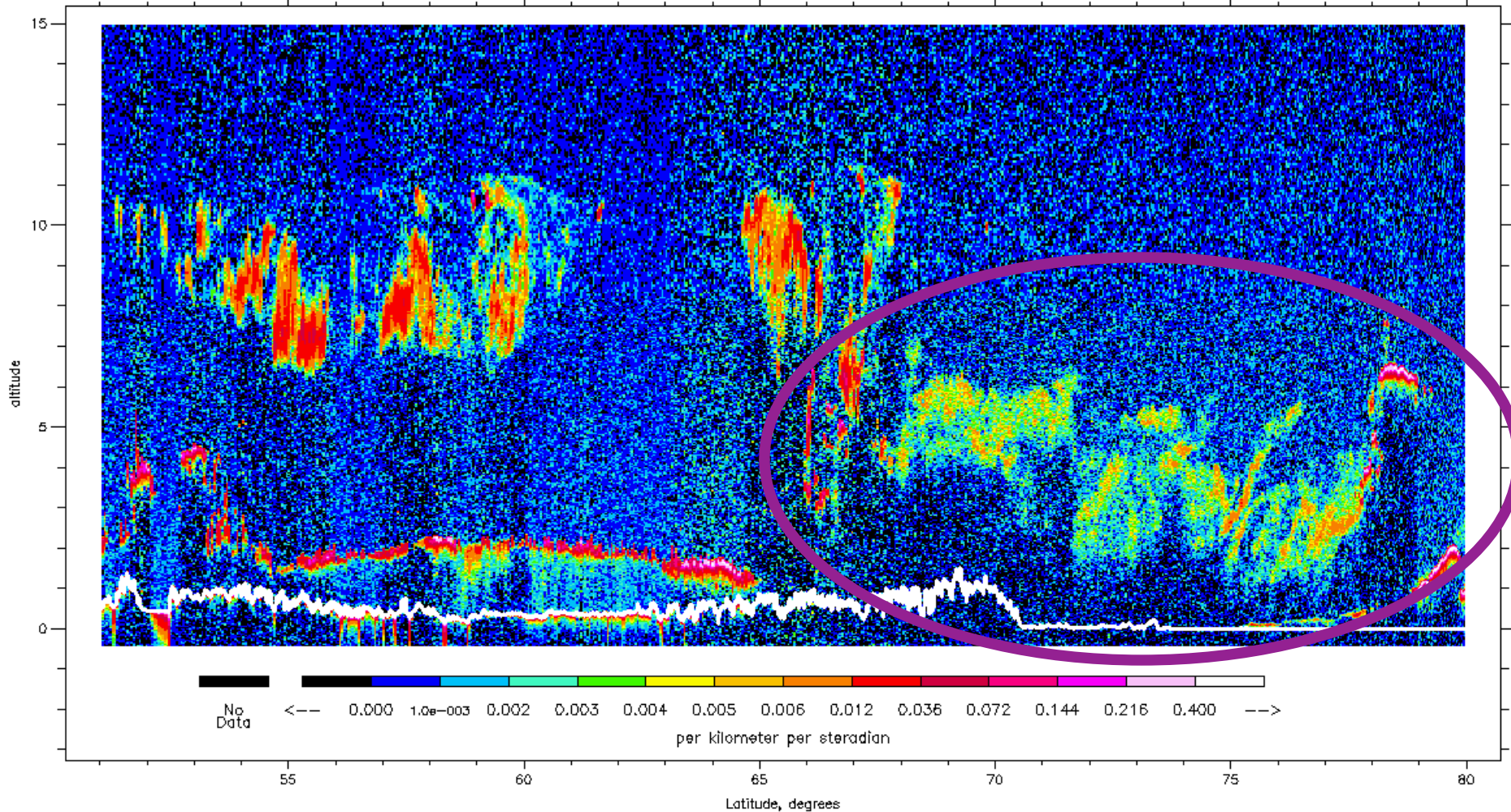
As part of the NASA Langley Science Directorate, the CERES Science, Data Management, Data Processing and Stewardship Teams are devoted to providing valuable Earth Radiation Budget data to the science community. The CERES experiment is one of the highest priority scientific satellite instruments developed for NASA's Earth Observing System (EOS). The first CERES instrument was launched in December of 1997 aboard NASA's Tropical Rainfall Measuring Mission (TRMM). CERES instruments are now collecting observations on three separate satellite missions, including the EOS Terra and Aqua observatories and now also on the NPOESS Preparatory Project (NPP) observatory.

CERES products include both solar-reflected and Earth-emitted radiation from the top of the atmosphere to the Earth's surface. Cloud properties are determined using simultaneous measurements by other EOS and NPP instruments such as the Moderate Resolution Imaging Spectroradiometer (MODIS) and the Visible and Infrared Sounder (VIRS). Analyses using CERES data, build upon the foundation laid by previous missions such as NASA Langley's Earth Radiation Budget Experiment (ERBE), leading to a better understanding of the

CALIPSO data

Browse Image with average every 15 profiles of Total_Attenuated_Backscatter_532

Data Range: 40801: 51600: 1; 1: 583: 1



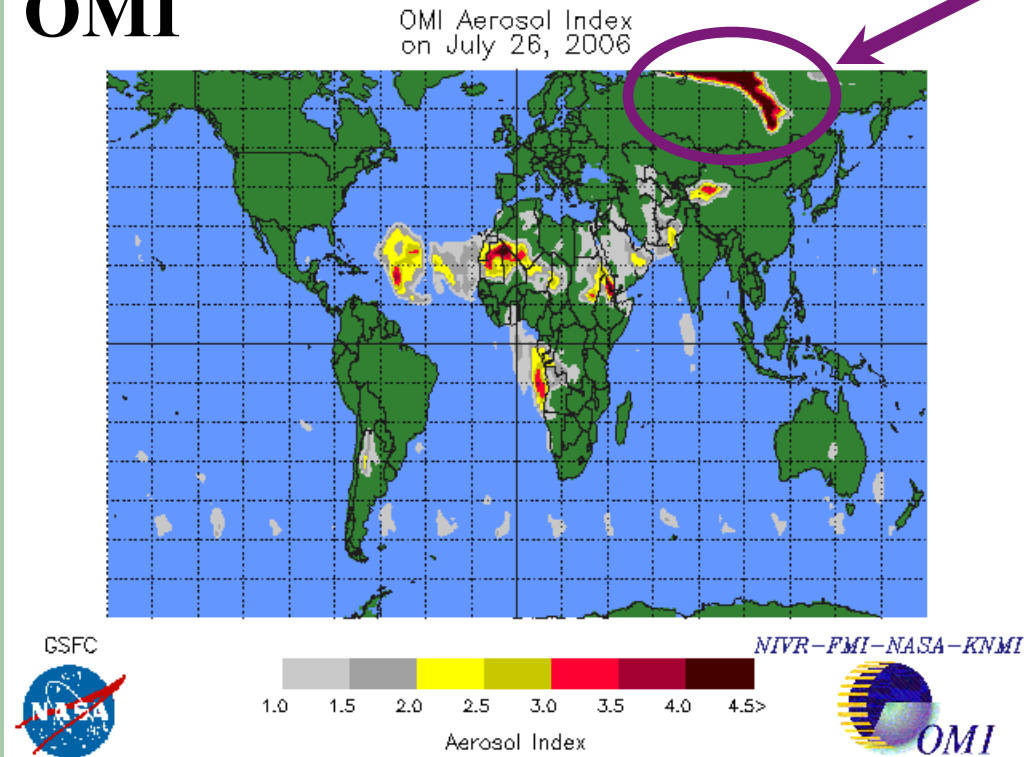
File: R:\validation\LSWG_SandBox\data\input\CAL_LID_L1_Exp-Launch-V1-06.2006-07-26T05-22-10ZD.hdf Date: Tue Aug 15 16:54:24 2006

CALIPSO captures both the maximum altitude of the smoke plume at about 6 km and the vertical smoke structure, as it evolves over time.

CALIOP Data

On July 26, 2006, the Aerosol Index (AI) peaked in Siberia due to an extreme wildfire event, which traveled northwest over the North Pole. During this time, CALIPSO captured the vertical height and structure of the smoke plume.

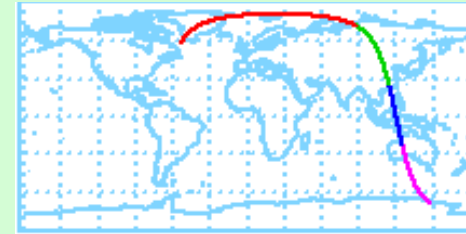
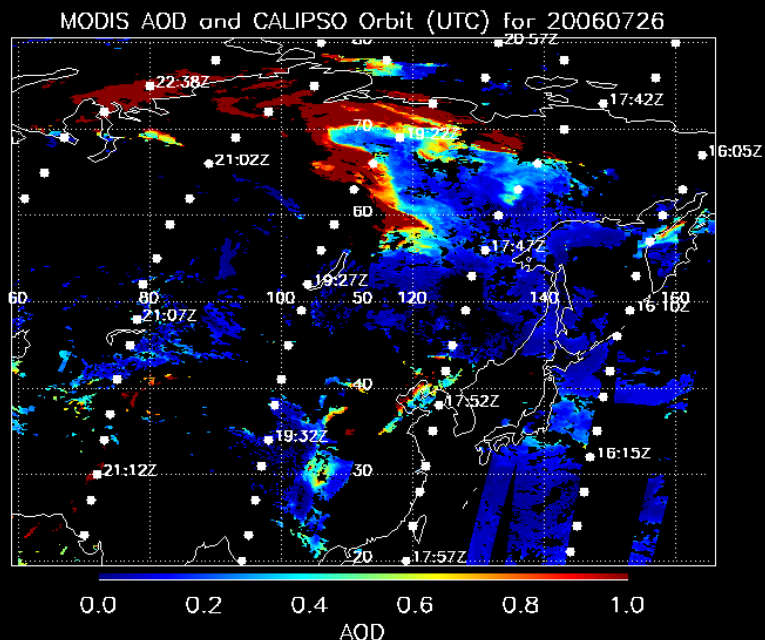
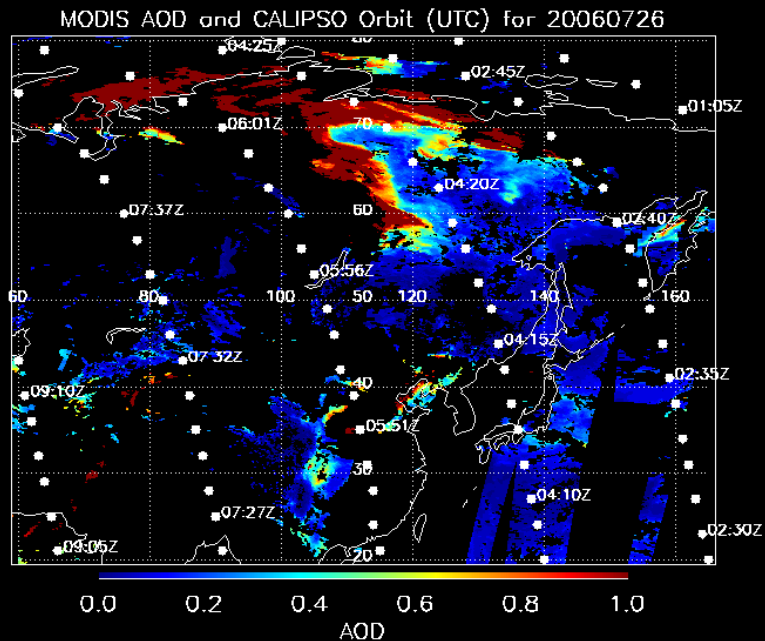
OMI



- CALIPSO combines an active lidar instrument with passive infrared and visible imagers to probe the vertical structure and properties of thin clouds and aerosols.
 - 30 meter vertical resolution, 100 m swath.
 - Data extends from sea level to 30 km.
- Launched on April 28, 2006 with CloudSat.

<http://www-calipso.larc.nasa.gov/>

Coincidence in Siberian wildfire, MODIS Aerosol Optical Depth (AOD) and the CALIPSO path.

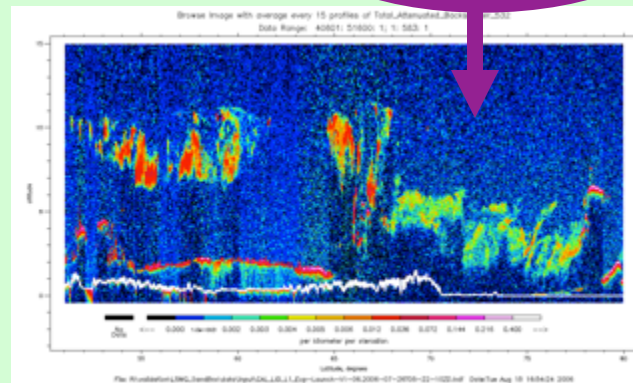
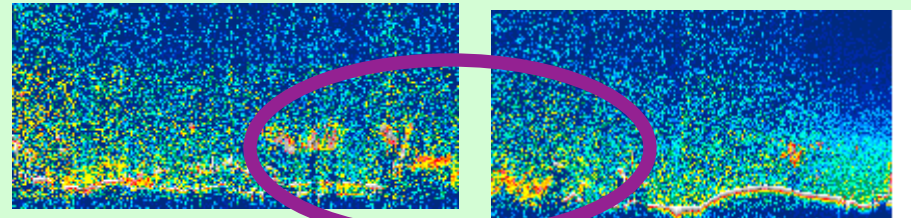


CALIPSO flight track (green & red tracks shown below)

About 12:00 to 13:00 pm local time

Begin: 2006/07/26 05:22:09.5520 UTC

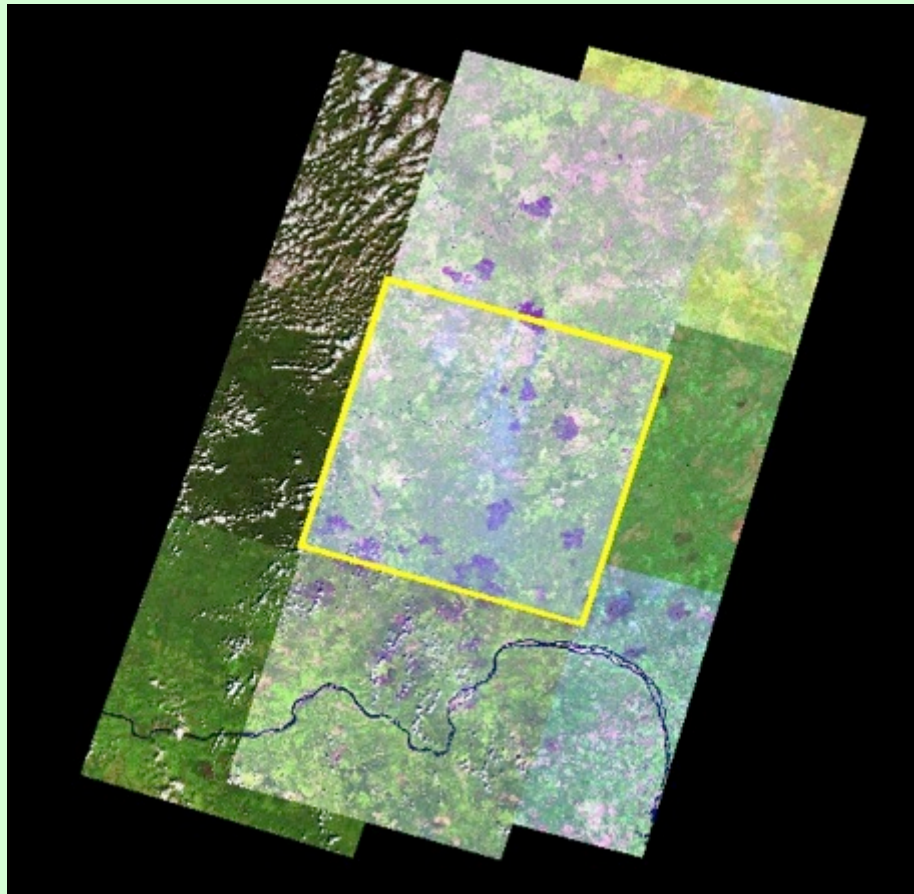
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CALIPSO
data

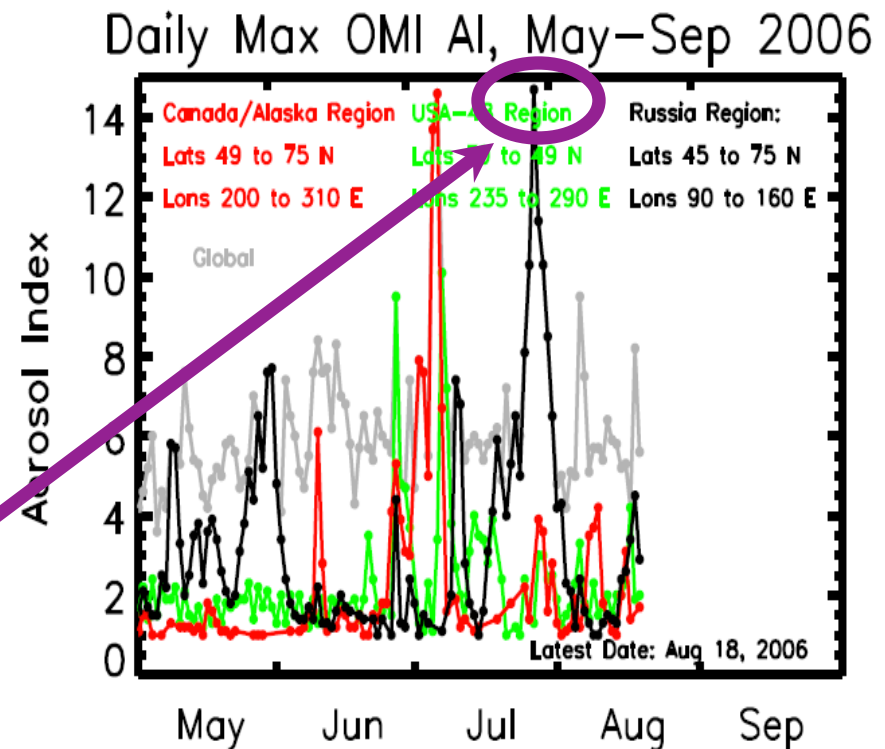
Expanded view,
next slide

2006 fire event that burned in Evenkia, Siberia.



Landsat (30 m resolution) data
showing the fire scars in
Evenkia, Siberia.

Large wildfire-induced
aerosol event from Siberia.



LANDSAT Data

<http://glovis.usgs.gov/QuickStart.shtml>

USGS Global Visualization Viewer - Mozilla Firefox

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glovis.usgs.gov/QuickStart.shtml

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USGS Global Visualization Viewer: Quick Start Guide

Getting Started

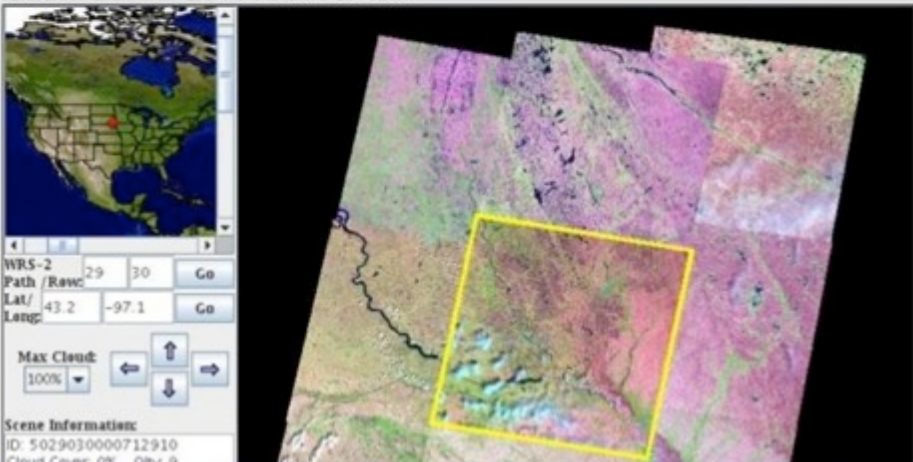
The [USGS Global Visualization Viewer](#) is a quick and easy online search and order tool for selected satellite and aerial data. When you open the USGS Global Visualization Viewer, you will see the Browse Image Viewer in the middle of the page:

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WRS-2 Path / Row: 29 30 Go
LAT / LONG: 43.2 -97.1 Go

Max Cloud: 100%

Scene Information:
ID: 5029030000712910
Cloud Cover: 0% 00% 9



MODIS Land Proc

<https://lpdaac.usgs.gov>

One MUST read th

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HOME ABOUT PRODUCTS GET DATA TOOLS USER COMMUNIT

- Other Data Links
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- NAALSED
- MODIS Overview
- MODIS Products Table
- ASTER Overview
- ASTER Policies
- ASTER Products Table

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MODIS Produ

These links will direct yo
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- Radiation Budget Va
- Ecosystem Variables
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usgs.gov <https://lpdaac.usgs.gov/products/>

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MODIS QA Tutorial - How to find, understand, and use the quality assurance information for MODIS land products.

For information on how to cite LP DAAC data, please see our data citations page at https://lpdaac.usgs.gov/about/citing_lp_daac_and_data

Shortname	Platform	MODIS Product	Raster Type	Res (m)	Temporal Granularity
MCD45A1	Combined	Burned Area	Tile	500m	Monthly
MOD09GA	Terra	Surface Reflectance Bands 1-7	Tile	500/1000m	Daily
MYD09GA	Aqua	Surface Reflectance Bands 1-7	Tile	500/1000m	Daily
MOD09GQ	Terra	Surface Reflectance Bands 1-2	Tile	250m	Daily
MYD09GQ	Aqua	Surface Reflectance Bands 1-2	Tile	250m	Daily
MOD09CMG	Terra	Surface Reflectance Bands 1-7	CMG	5600m	Daily
MYD09CMG	Aqua	Surface Reflectance Bands 1-7	CMG	5600m	Daily
MOD09A1	Terra	Surface Reflectance Bands 1-7	Tile	500m	8 Day
MYD09A1	Aqua	Surface Reflectance Bands 1-7	Tile	500m	8 Day
MOD09Q1	Terra	Surface Reflectance Bands 1-2	Tile	250m	8 Day
MYD09Q1	Aqua	Surface Reflectance Bands 1-2	Tile	250m	8 Day
MOD13A1	Terra	Vegetation Indices	Tile	500m	16 Day
MYD13A1	Aqua	Vegetation Indices	Tile	500m	16 Day
MOD13A2	Terra	Vegetation Indices	Tile	1000m	16 Day
MYD13A2	Aqua	Vegetation Indices	Tile	1000m	16 Day
MOD13Q1	Terra	Vegetation Indices	Tile	250m	16 Day
MYD13Q1	Aqua	Vegetation Indices	Tile	250m	16 Day

<http://www-modis.bu.edu/landcover/>

Home - Mozilla Firefox

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www-modis.bu.edu/landcover/

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MODIS Land Cover Group

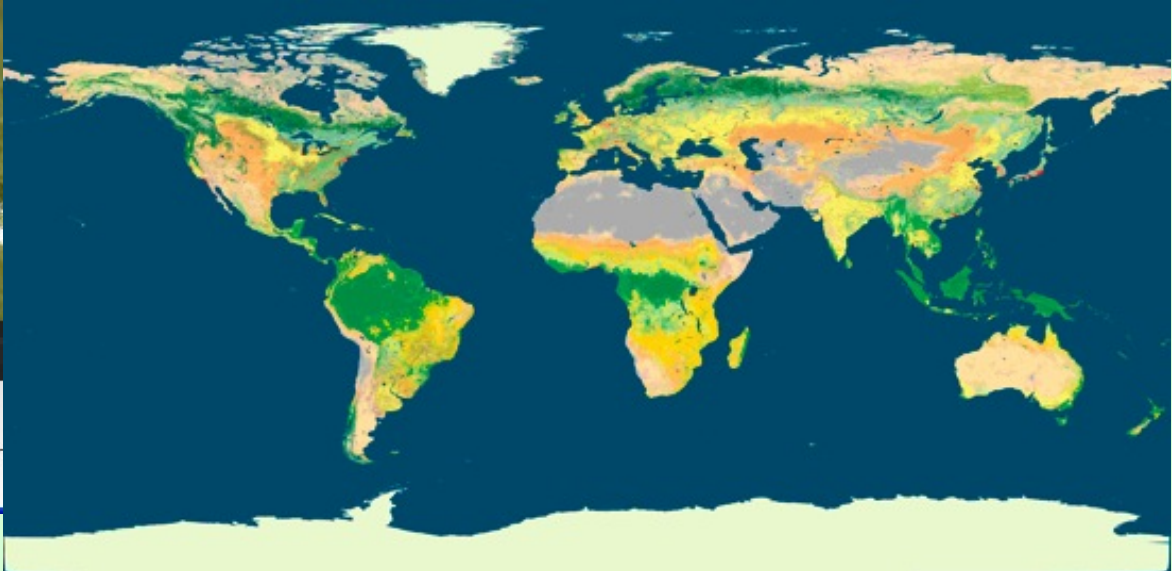
Department of Geography and Environment at Boston University

Land Cover and Land Cover Dynamics -
Classifying global biomes and
monitoring their dynamics ...

OVERVIEW RESEARCH DATA & DOCUMENTATION PUBLICATIONS TEAM INFORMATION

Latest News

Welcome to the homepage of the MODIS Land Cover and Land Cover Dynamics Group at Boston University.



Interim Highlights

Climate and weather have changed and are predicted to change, particularly in the Northern Hemisphere, upper latitude winters.

Satellite data provide the opportunity to scale up from a small scale to view a larger scale; to define land cover and fire change; to quantify healthy vegetation versus unhealthy (using vegetation indices) and fire scars; to verify and validate our larger-scale understanding of climate, fire, clouds, weather, aerosols, Carbon Monoxide (CO), land cover and more.

We can access Landsat, fire data (data -detections, area burned- and pictures), LaRC DAAC (CERES, POWER, SRB, CALIOP), MODIS land cover data and products.

Satellite data can be combined to inform field campaigns and to clarify and define research.

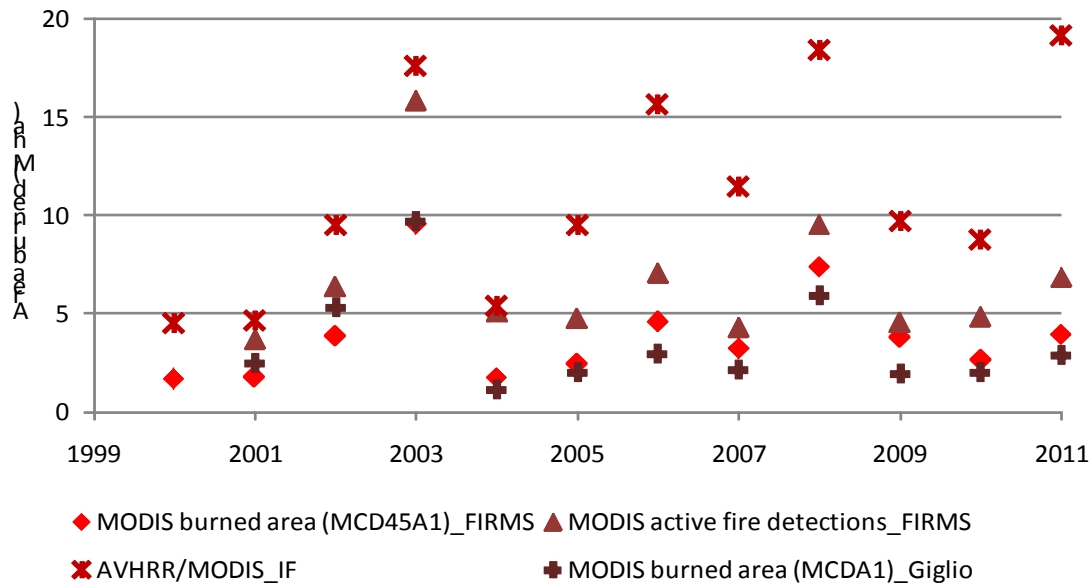
Fire Regimes and Emissions Vary Widely





The amount of fuel a forest contains is a partial determinant of its emissions following an ignition (cumulative temperature and precipitation, relative humidity and wind speed).

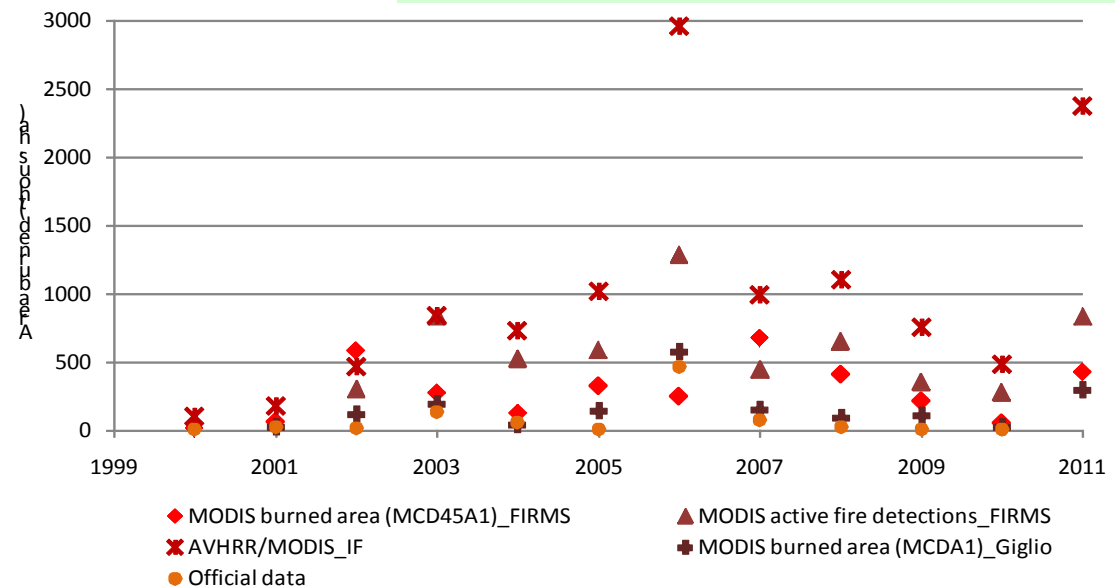
Using Satellite-based Land Cover and Fire Products to Estimate Fire Emissions - Elena Kukavskaya example



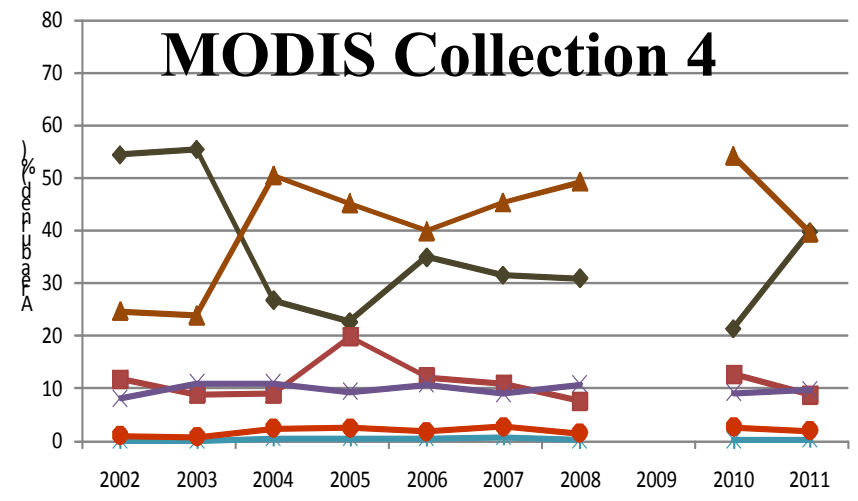
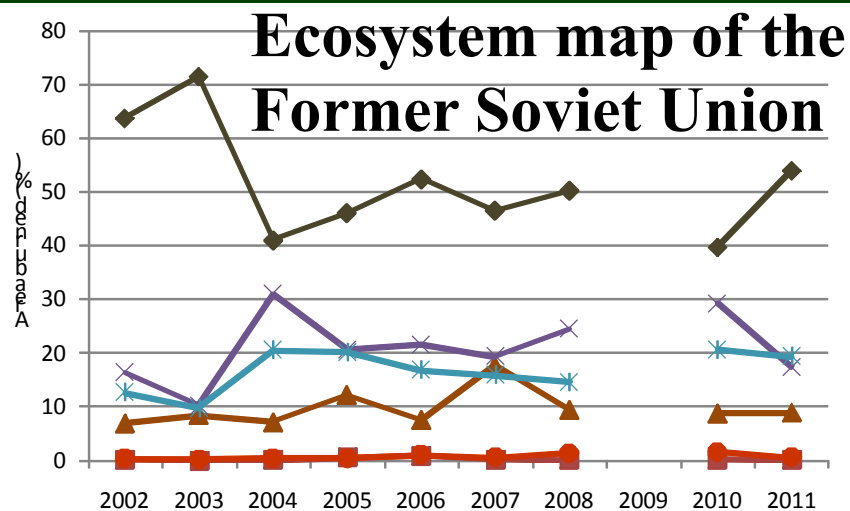
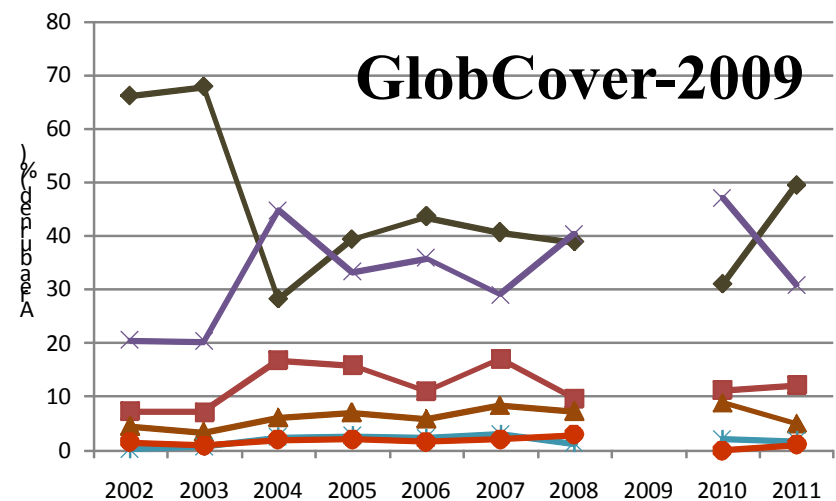
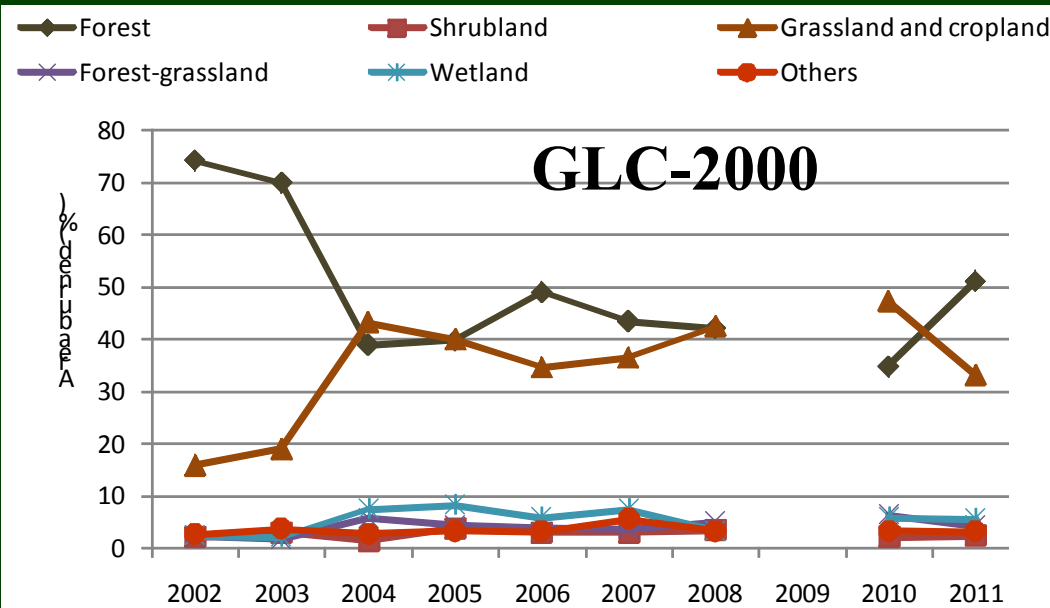
Area Burned across Siberia according to a variety of satellite products.

***** Large Differences**

Area Burned in Krasnojarsk according to a variety of satellite products.



Depending on the land cover maps and associated fuel assumptions, the amount of fire emissions estimated will vastly vary .





1 year after burn

Two instruments are capable of defining fire plume injection heights (if incorrect, transport incorrect as are Air Quality estimates and deposition (i.e. Black Carbon to Arctic).

CALIOP onboard Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) – underway.

Multi-angle Imaging SpectroRadiometer (MISR) - D. Diner, R. Kahn, J. Logan, et al. - used stereographic heights to derive plume height database (LaRC DAAC).



**1 year
after fire**

**Additionally, there are other
Distributed Active Achieve Centers
(DAAC)**

Oakridge DAAC

<http://daac.ornl.gov/>

**NOAA Comprehensive Large
Array-Data Stewardship System
(CLASS)**

**[www.class.ngdc.noaa.gov/saa/
products/welcome](http://www.class.ngdc.noaa.gov/saa/products/welcome)**

**NASA Goddard Earth Sciences
Data and Information Services
Center**

<http://daac.gsfc.nasa.gov/>

Existing freeware (free software)

GDAL (Goodall or Gee-Dal) is an open source programming library and set of utilities that allow you to manipulate raster data.

For example, one could open and manipulate MODIS hdf files.

GRASS – Similar to Geographic Information System (GIS) - also written in Russia.

MapWindow – Similar to Geographic Information system.

Other costly tools – ERDAS IMAGINE, ENVI/IDL, ARC/GIS

Summary Example of Earth Satellite Data				
Sensor (spacecraft)	Product	Spatial Resolution	Satellite Overpass	Temporal Availability
MODIS (Terra and Aqua)	<u>Thermal anomaly</u> (fire detection), area burn, and Aerosol Optical Depth (AOD)	500 m area burned, Fire detection 1 km², and AOD 10 x 10 km² product	10:30 a.m. 1:30 p.m. 6:30 p.m.	Active fire and AOD 4 times per day (1 day, 1 night overpass per sensor x 2 sensors), 8-day area burned
MISR (Terra)	AOD, aerosol plume height	17.6 x 17.6 km²	10:30 a.m.	~Once every 7 days
MOPITT (Terra)	<u>Columnar CO</u> (combustion tracer)	22 x 22 km²	10:30 a.m. 10:30 p.m.	Twice every 3 days
ASTER (Terra)	Level 3 AST14OTH Orthorectified	15 m	10:30 a.m. 6:30 p.m.	Twice per day
AWiFS	Georeferenced visible, NIR, and SWIR data	56 m	variable	Tasked data every ~5 days; orbiting every 14 days
Landsat	L5 and L7	30 m	variable	<u>Every 16 days</u>
AIRS (Aqua)	CH ₄ , Columnar CO (combustion tracer)	45 km diameter	1:30 a.m 1:30 p.m.	Twice every day
OMI (Aura)	AOD, SSA	13 x 24 km²	1:45 p.m.	Every day
CALIOP (CALIPSO)	extinction profile	100 m diameter x 30 m vertical	1:40 p.m.	Once every 16 days
GOES (east and west)	ABBA instantaneous area	16 km²	Geostationary Orbit	30 minute data (2 sensors, 15 minute data)



You are welcome to copy this presentation for your future reference, today or tomorrow (or send an email request).

*** GDAL presentation and word doc**

Photo courtesy of Brian Stocks

MODIS name: MCD64A1

Familiar name: Louis Giglio's burned area

Product base: Daily active fire detections (both Terra and Aqua) augmented by changes in daily vegetation/scar indices.

Purpose: Global burned area mapping at near-real time that can account for missed burns due to clouds.

Status: Validation with Tatiana Loboda in published works. No validation has started yet in a formal capacity (i.e. through the Cal/Val teams).

MODIS name: MCD45A1

Familiar name: David Roy's product (in conjunction with Luigi Boschetti)

Product base: Daily bidirectional reflectance corrected albedo (both Terra and Aqua)

Purpose: Global burned area mapping due to albedo changes in surface reflectance

Status: Validated using GOFC-GOLD standards (<http://landval.gsfc.nasa.gov/ProductStatus.php?ProductID=MOD45>)

Availability: http://modis-fire.umd.edu/Burned_Area_Products.html

MODIS name: MOD12Q2

Familiar name: Boston land cover product (made at Boston University)

Product base: 13 months of daily surface reflectance (Terra only) for years 2001-2002

Purpose: 500 m – 1 km global land cover map using the IGBP land cover classification schema (<http://duckwater.bu.edu/lc/igbp.txt>)

Status: Validated using GOF-C-GOLD standards (<http://landval.gsfc.nasa.gov/ProductStatus.php?ProductID=MOD12>)

<http://modis-land.gsfc.nasa.gov/landcover.htm>

MODIS name: MOD/MYD14A1

Familiar name: Louis Giglio's product

Product base: Daily thermal anomalies (both Terra and Aqua)

Purpose: Map the centroid of 1 km MODIS pixels in which a thermal anomaly is detected

Status: Validated using GOFC-GOLD standards
(<http://landval.gsfc.nasa.gov/images/MOD14Val.png>)

Availability: http://modis-fire.umd.edu/AF_getdata.html