MODIS & ASTER PRIMER

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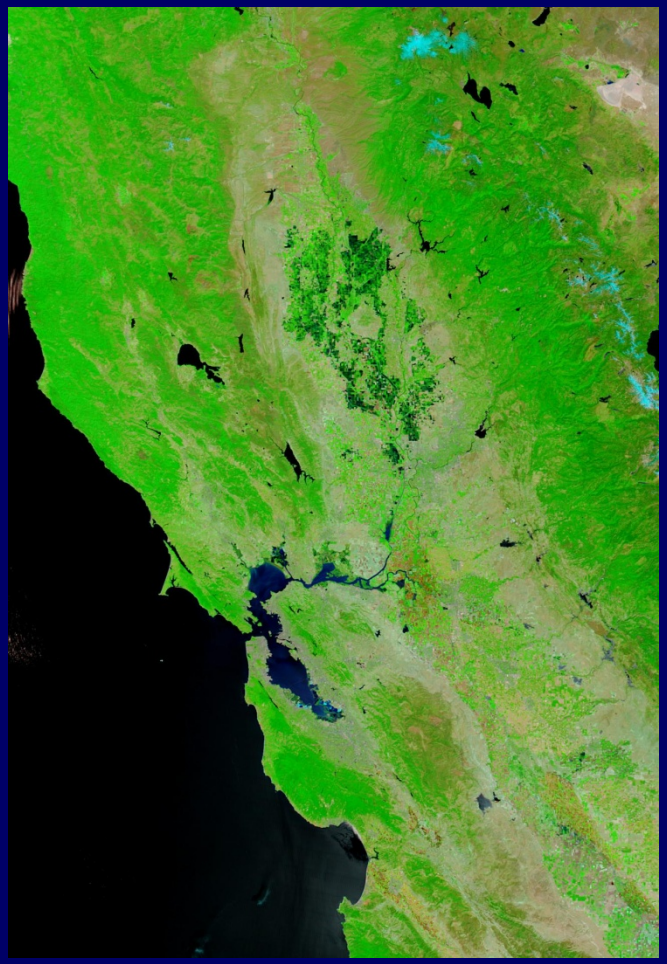
USDA ARS Pacific West Area Remote Sensing Workshop 29 April 2009

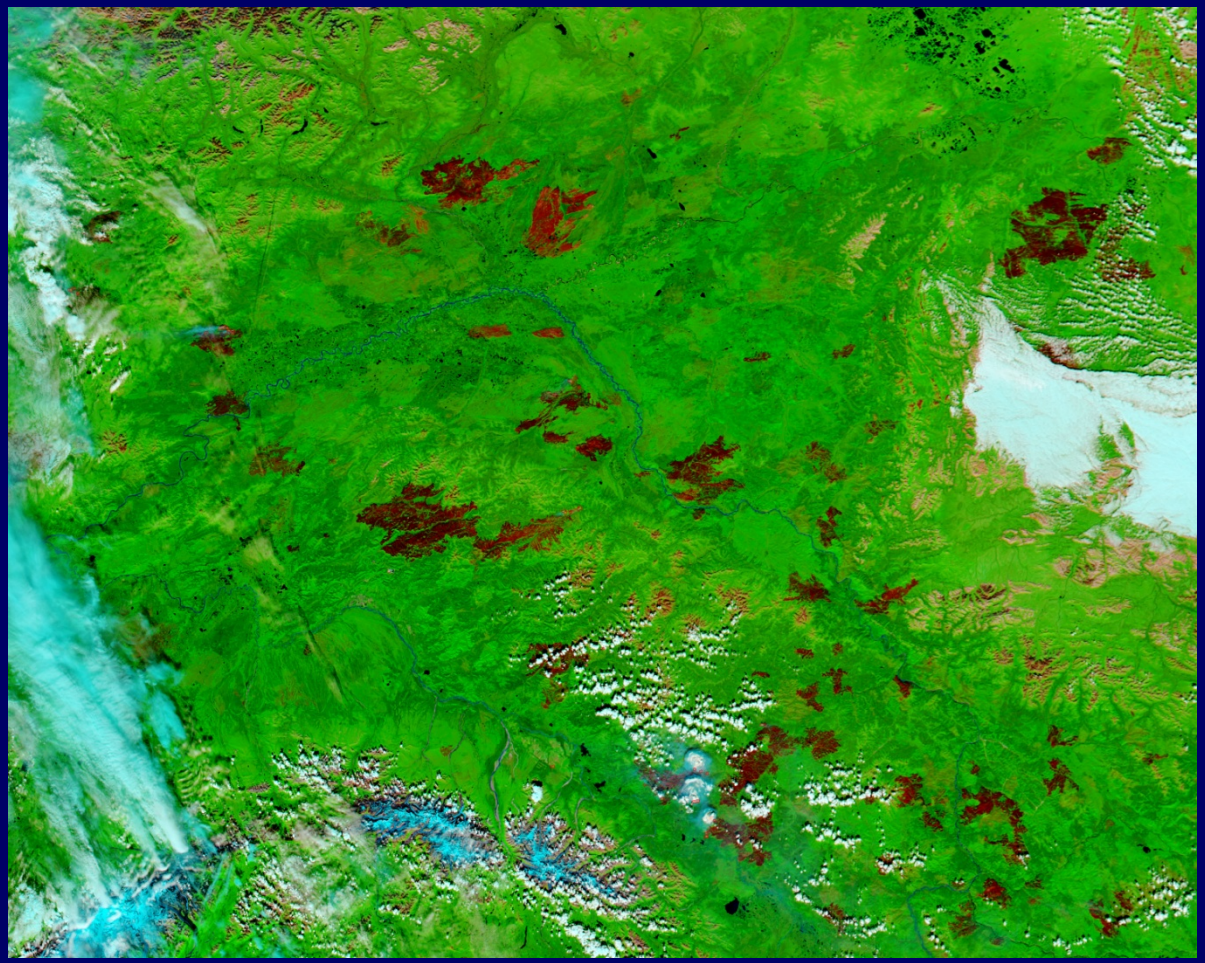
California 2004

http://visibleearth.nasa.gov



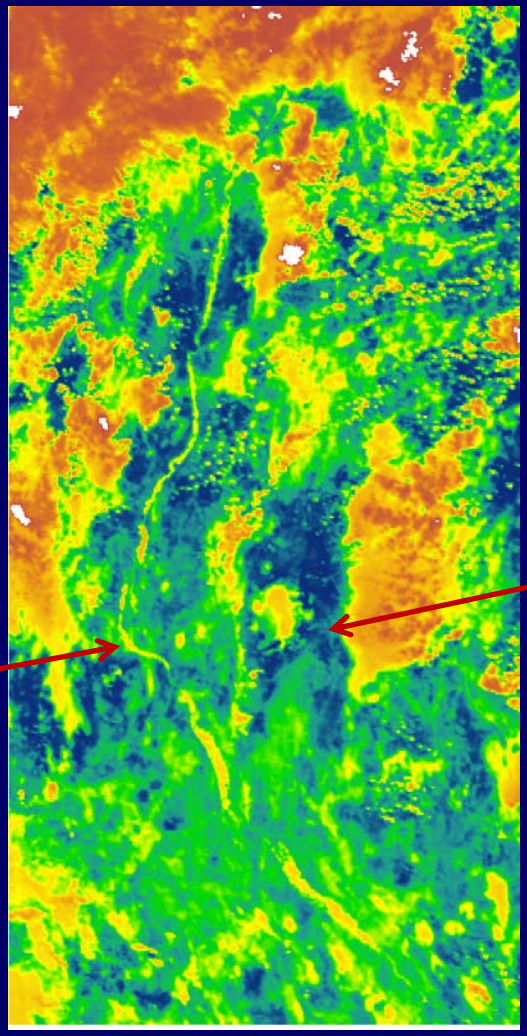
Alaska Fires 2004

Also see: http://www.fs.fed.us/eng/rsac/



Imperial Valley, CA

New Mexico Rio Grande Valley Thermal Infrared

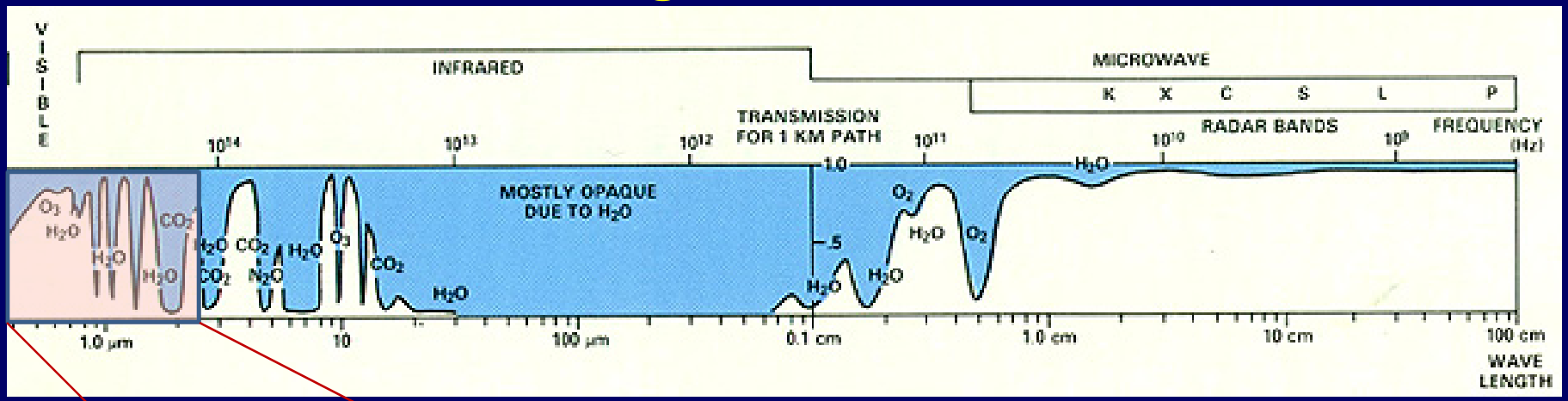


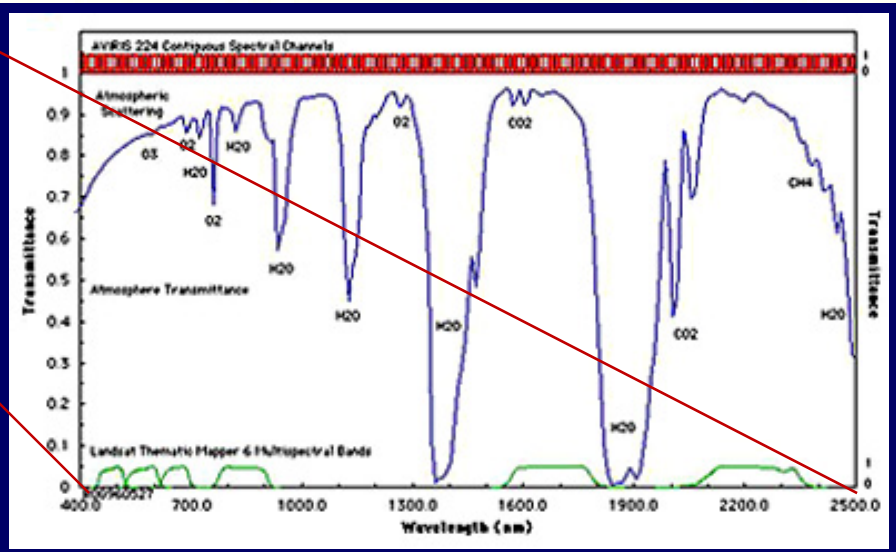
Moderate Resolution Imaging Spectroradiometer
Why would you want MODIS data?

- 36 Bands from Blue to Thermal Infrared (0.4-14 µm)
  - Discrimination of soil, water, vegetation & their characteristics
- Resolution
  - 250 m (bands 1, 2; red & nir)
  - 500 m (bands 3-7; vnir & swir)
  - 1000 m (bands 8-36; vnir & tir)
- Two satellites: Terra (AM) & Aqua (PM), 4 overpasses/day
- Sun-synchronous: 10:30 & 13:30 + nighttime
- 16-day repeat period; observations possible 1-2 days
- Swath: 2330 km (compared to TM: 183 km)
- *Free data, un-restricted use*

- modis.gsfc.nasa.gov

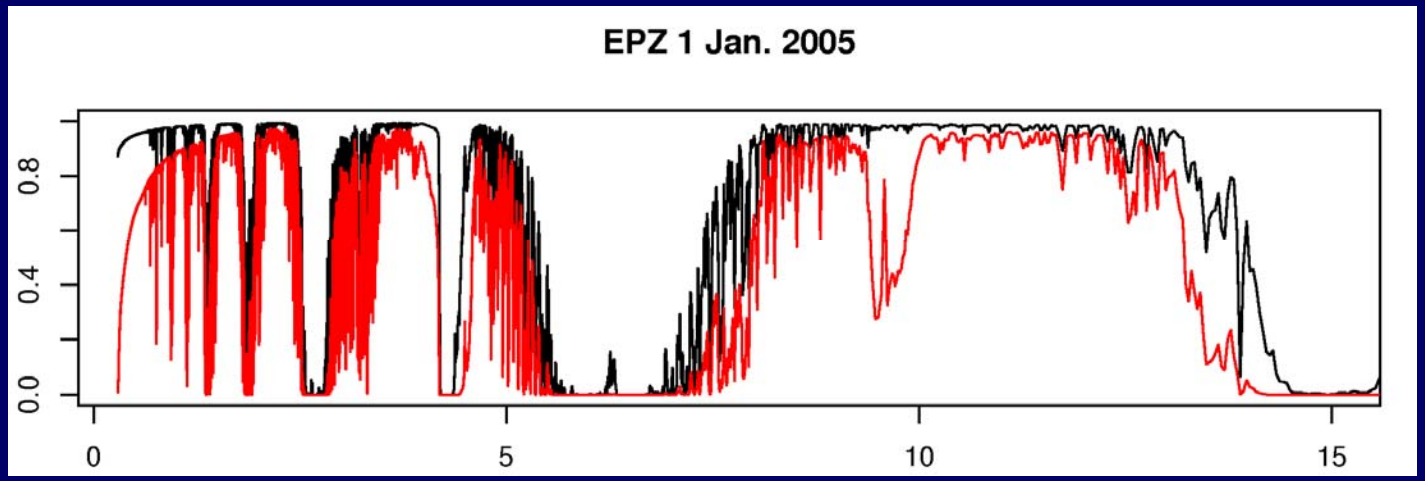
Remote Sensing Spectrum
figures courtesy rst.gsfc.nasa.gov
Remote Sensing Tutorial, Nicholas Short





Applications by Spectra

- Land/cloud/aerosol properties, vegetation
- Ocean color, biogeochemistry
- Atmospheric profiling
- Land surface temperature/emissivity



Getting MODIS Information & Data

- EDCDAAC: lpdaac.usgs.gov
- USGS Glovis: glovis.usgs.gov
- WIST: Warehouse Inventory Search Tool https://wist.echo.nasa.gov
- LAADSWEB for level 1 Data: http://ladsweb.nascom.nasa.gov
- MODIS Global Subsets, including time-series: http://daac.ornl.gov
- MODIS at National Snow and Ice Data Center

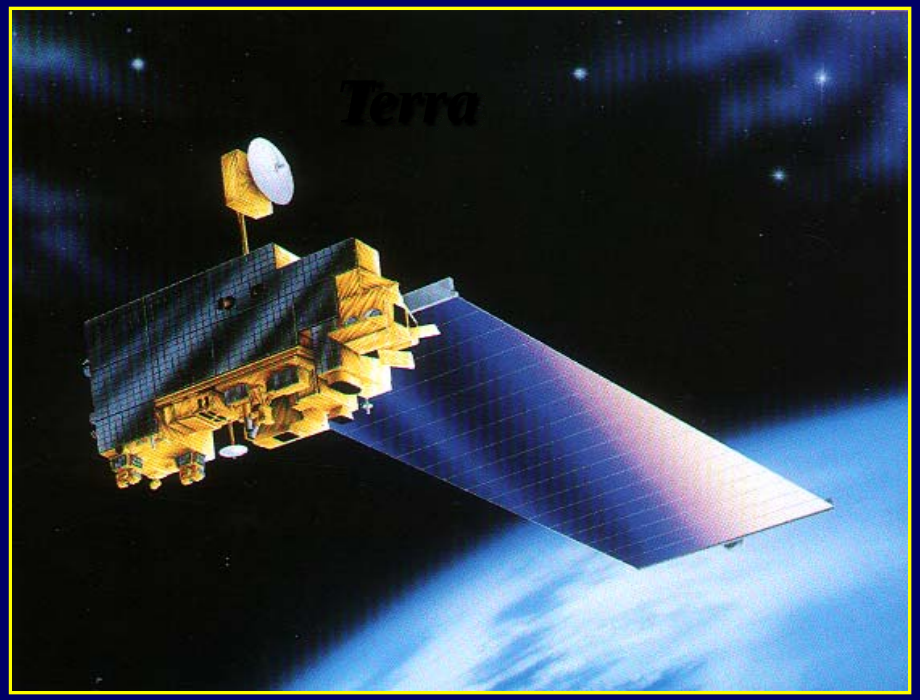
http://nsidc.org/data/modis/index.html

MODIS Data Format

- HDF 4: www.hdfgroup.org
- Platform-independent
- Requires library files to read or application such as ENVI, Imagine, Geomatics, Idrisi, Matlab, HDF Explorer
- Other options: https://lpdaac.usgs.gov/lpdaac/tools
  - Hdf2bin (convert to binary)
  - HEG (convert to GeoTIFF, Java interface)
  - MODIS MRT (reproject from Sinusoidal)

ASTER

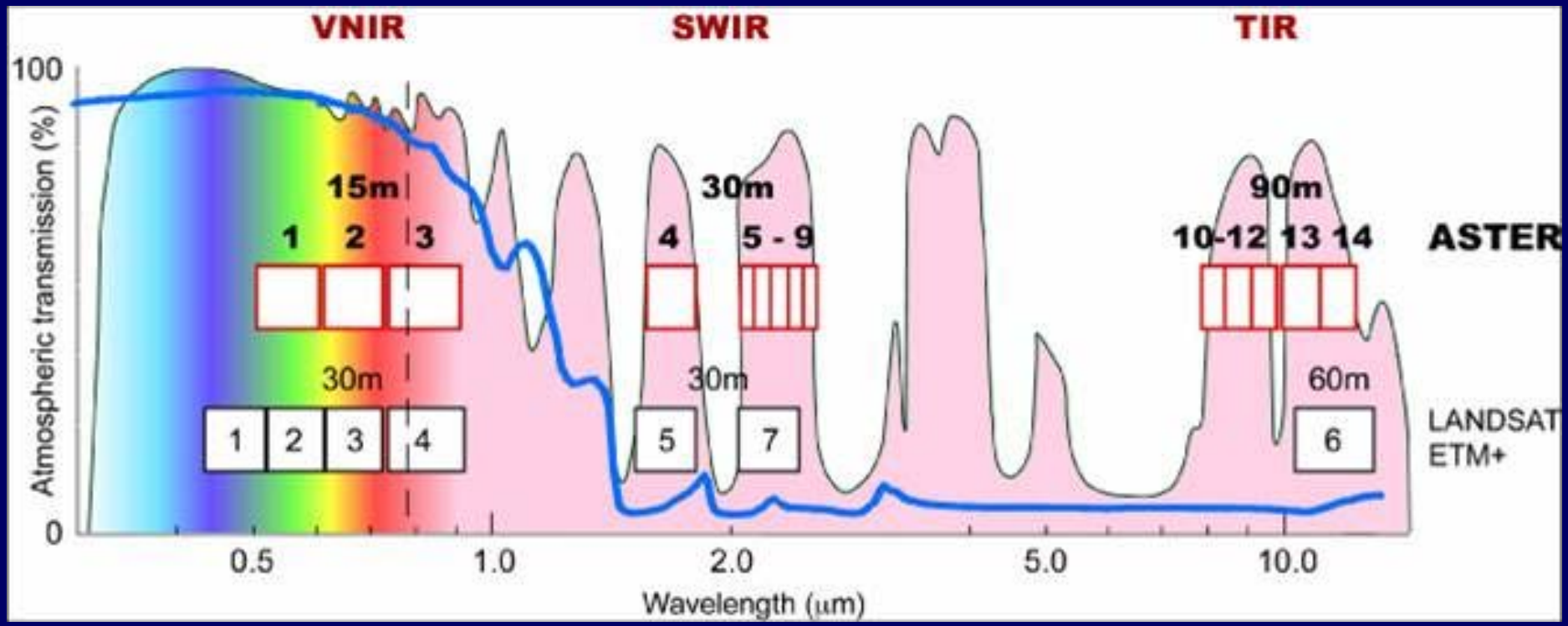
Advanced Spaceborne Thermal Emission and Reflection Radiometer



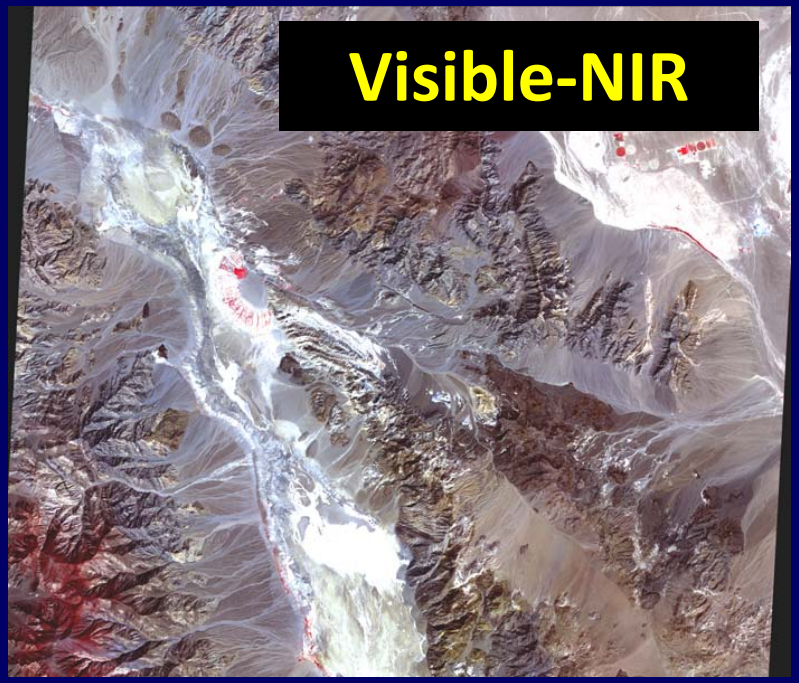
- Flies on Terra platform
- Built for METI in Japan
- Data processing in Japan and U.S.
- Instrument command and control by Japan and U.S.
- Joint Science Team

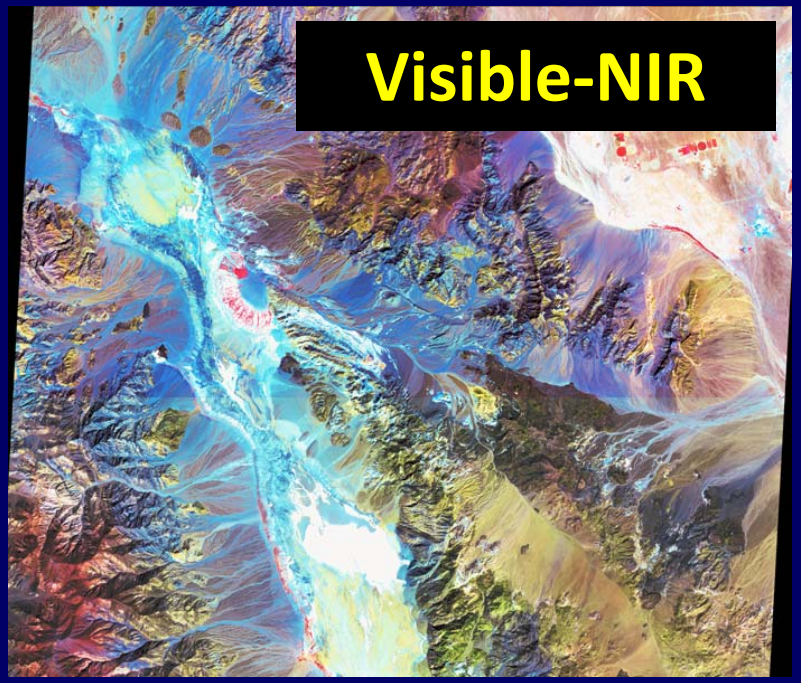
ASTER slides courtesy ASTER Science Team

Instrument Characteristics

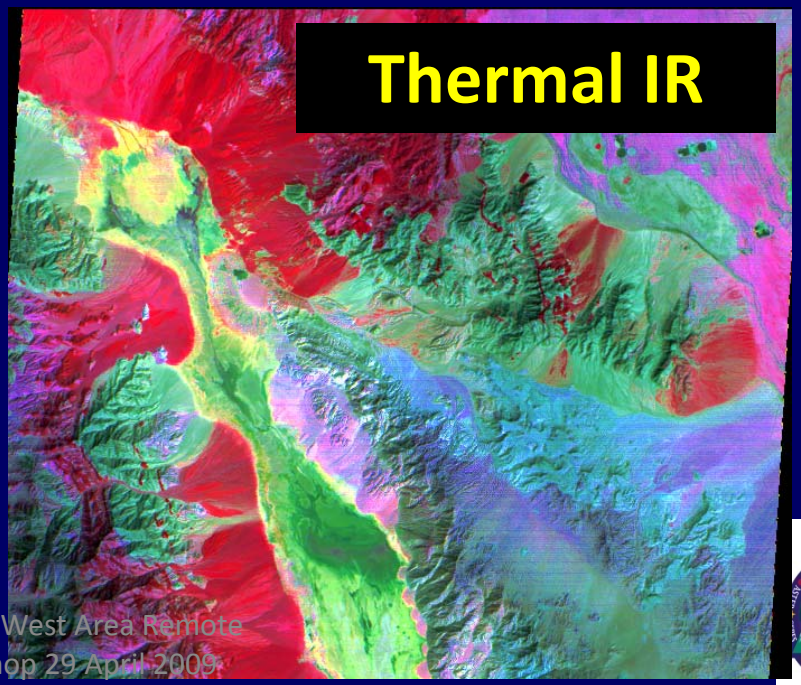


60 km swath; <16 day repeat cycle; stereo


Visible-NIR


Visible-NIR

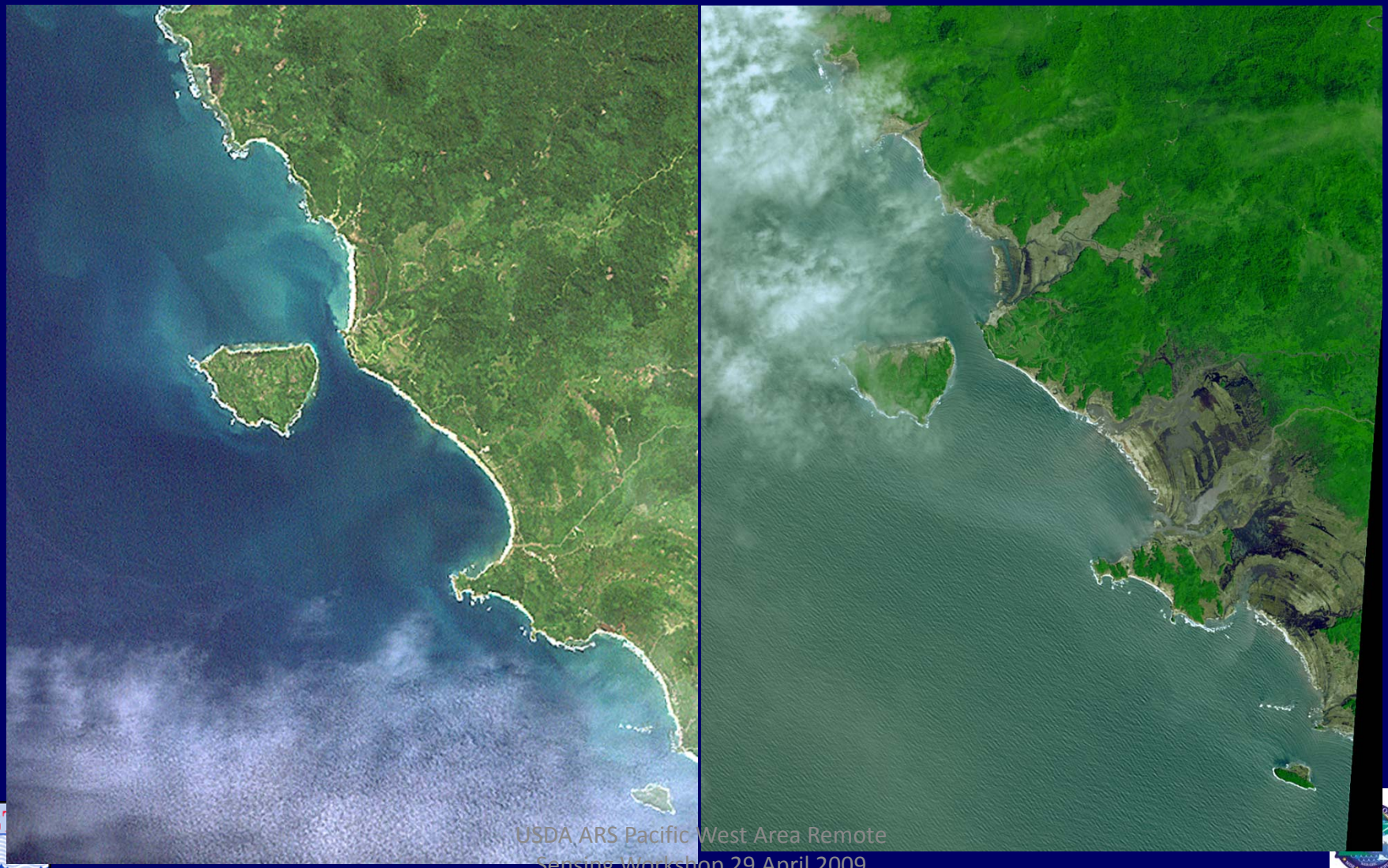

Short Wave IR


Thermal IR

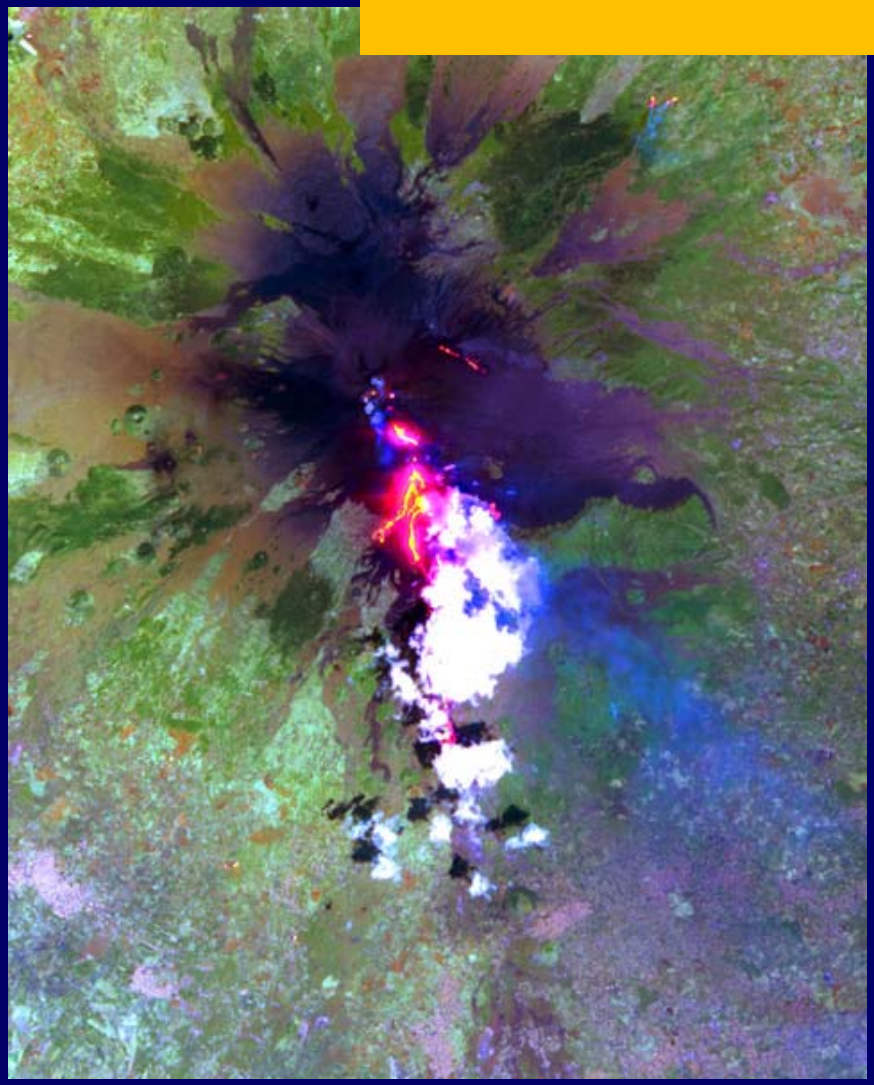

NASA
METI
経済産業省
Ministry of Economy, Trade and Industry
2004 Tsunami
ASTER
JAPAN/USA
USDA ARS Pacific West Area Remote
Sensing Workshop 29 April 2009

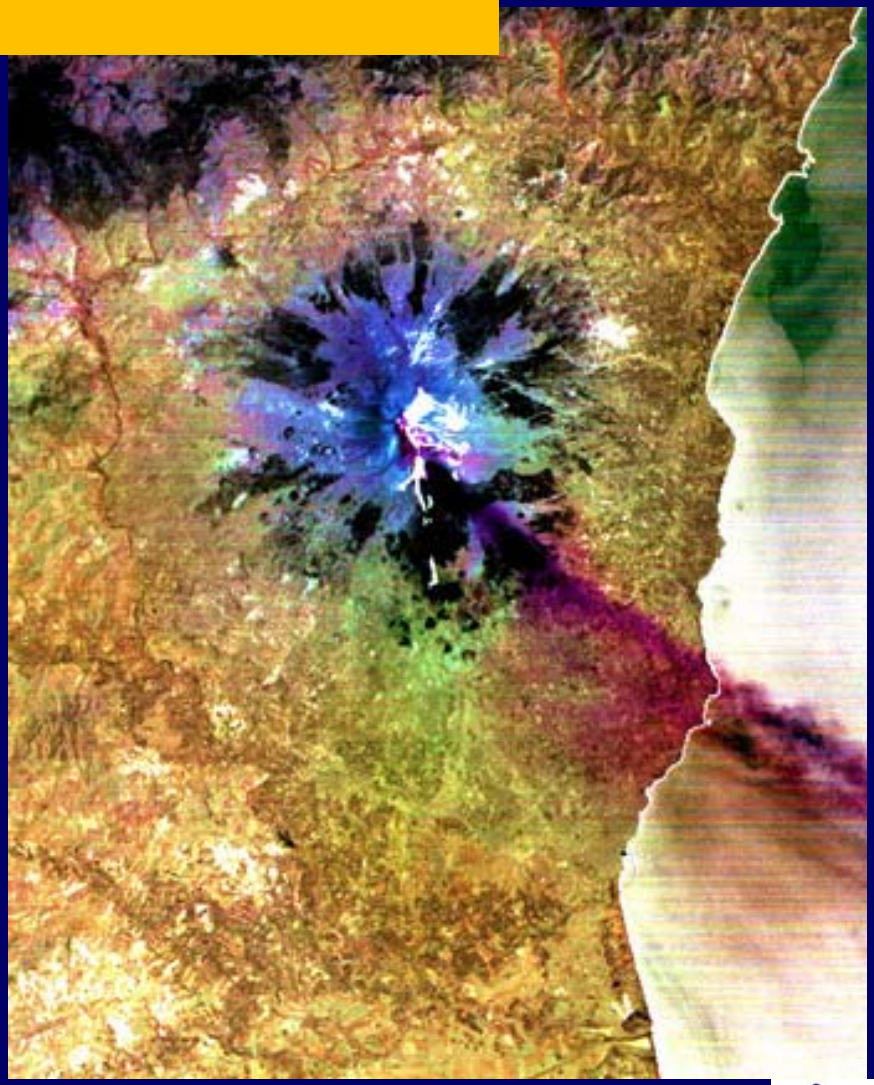
ASTER Response to Indian Ocean Tsunami

Banda Aceh before tsunami (left) and 5 days after tsunami (right)



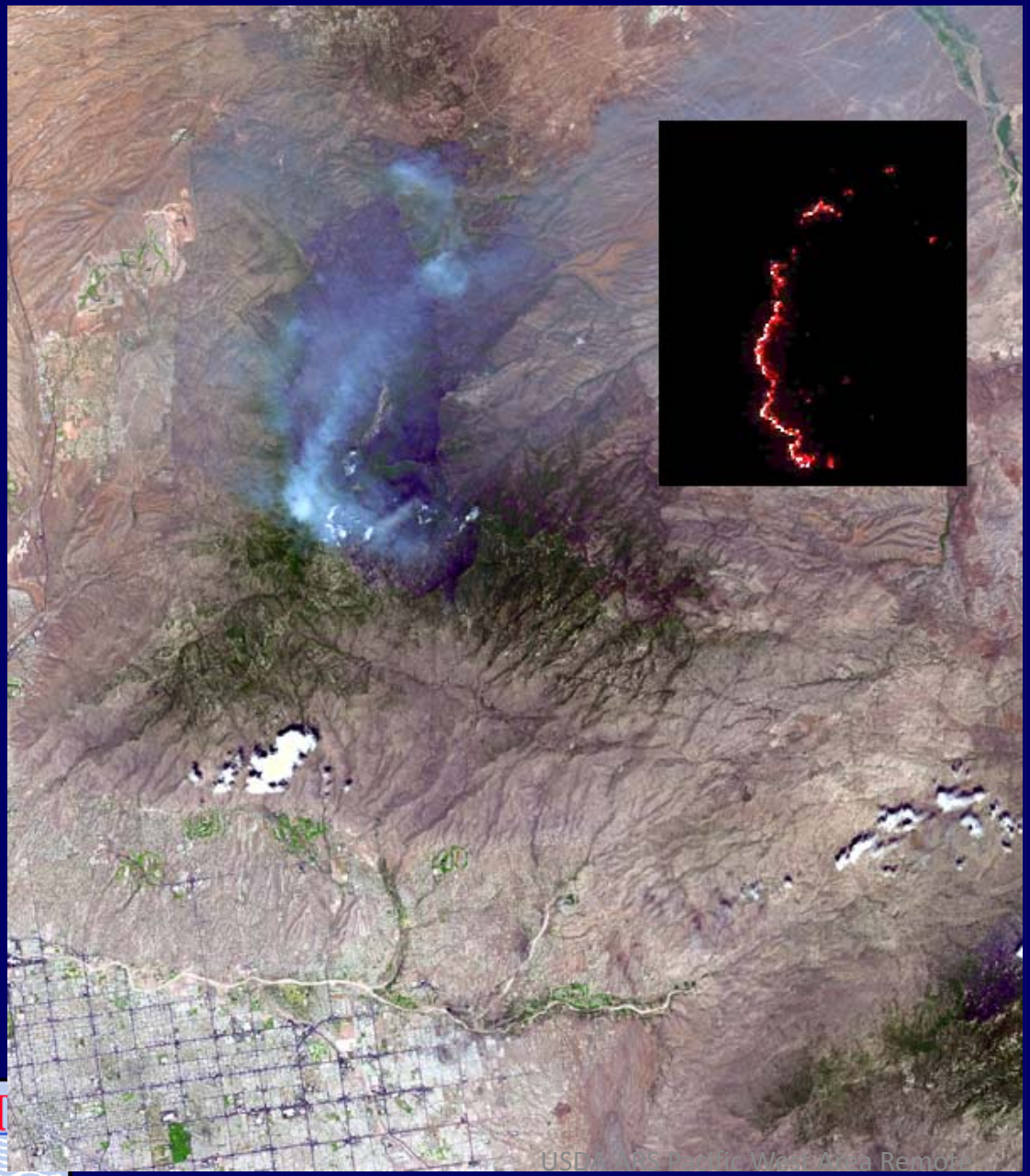
Eruption of Mt. Etna, Italy





Visible

Thermal

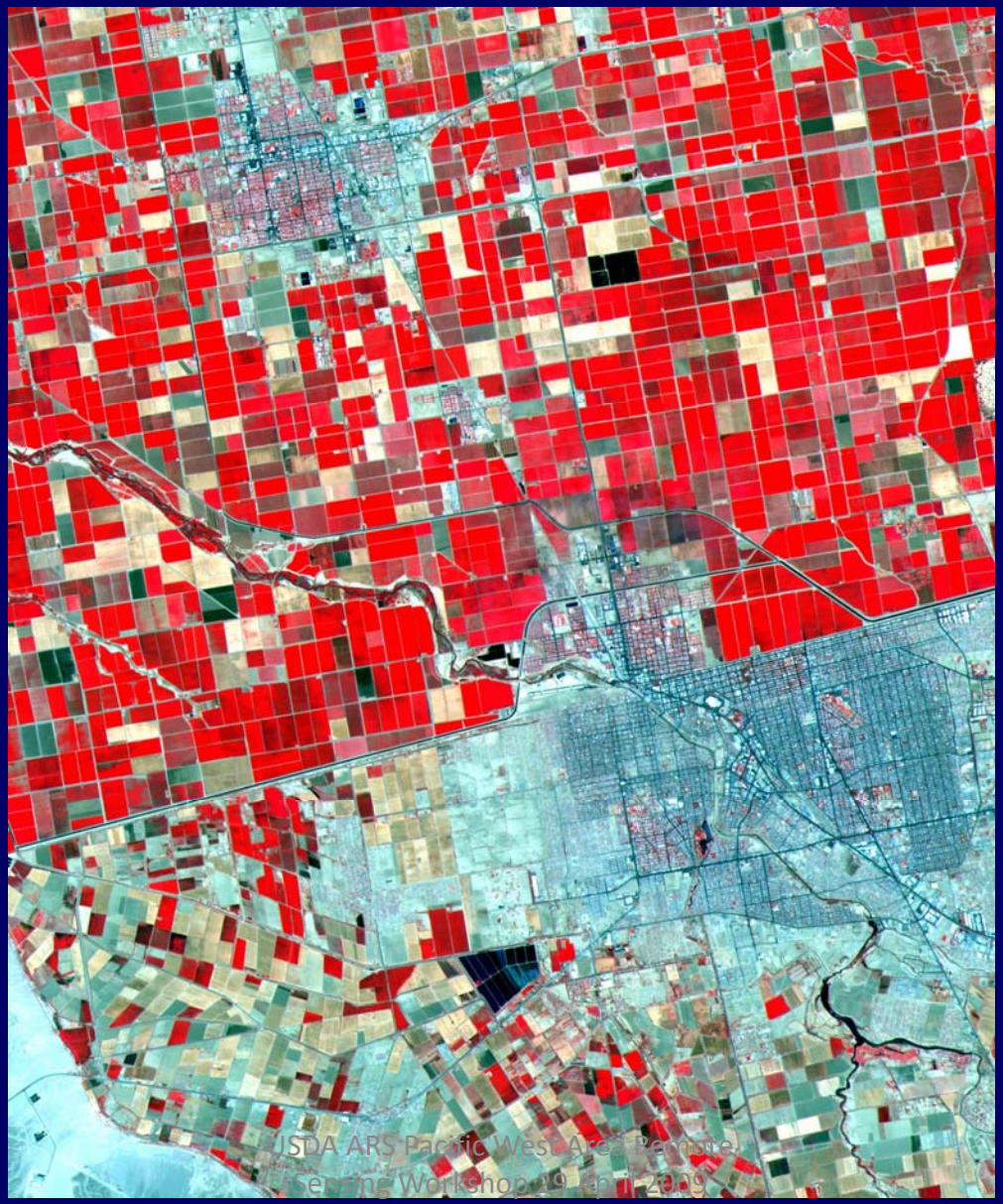


Aspen Fire, Tucson

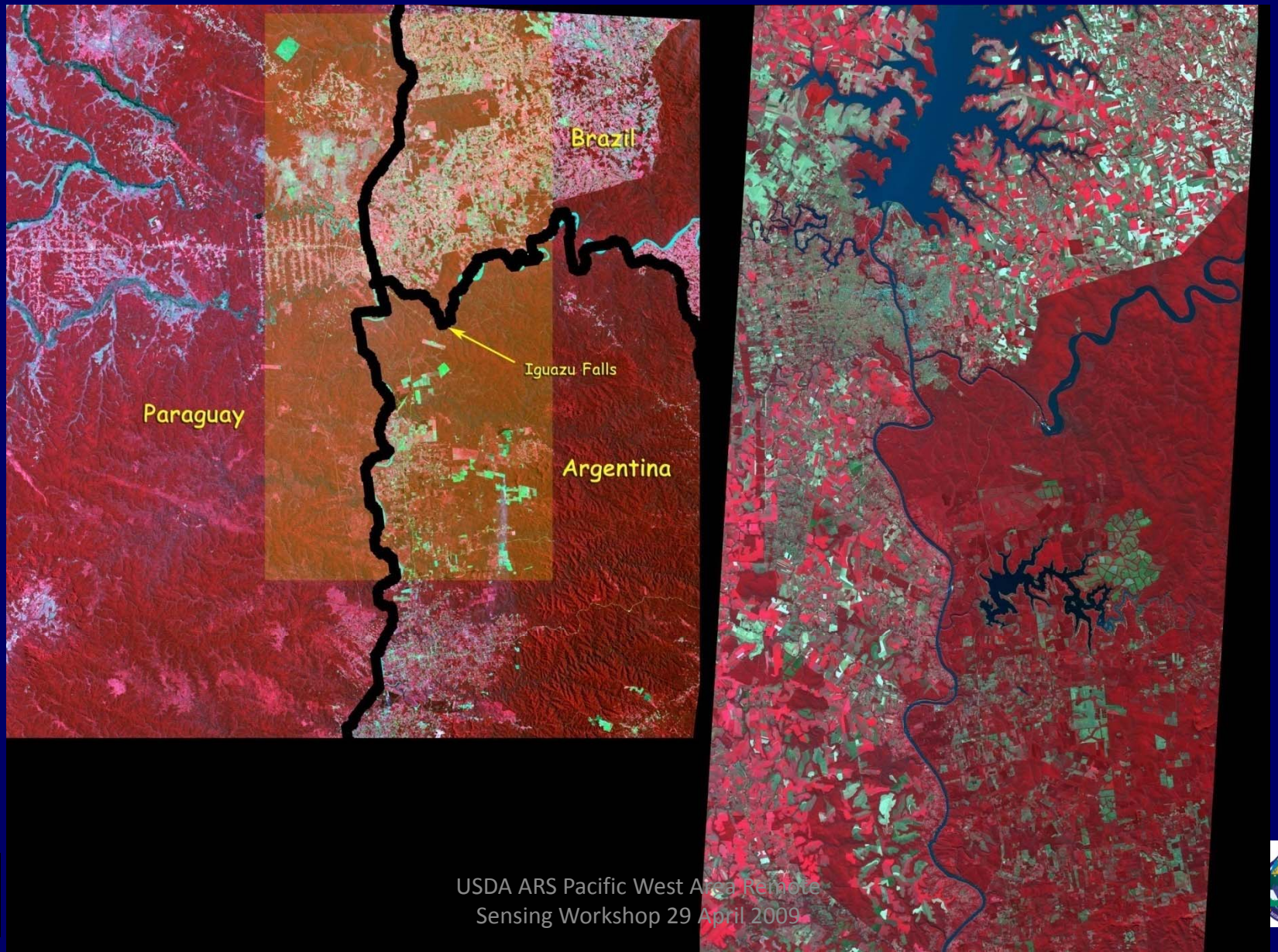
Day-night pair of ASTER images showing Aspen fire burning out of control in June 2003

Mississippi River Delta

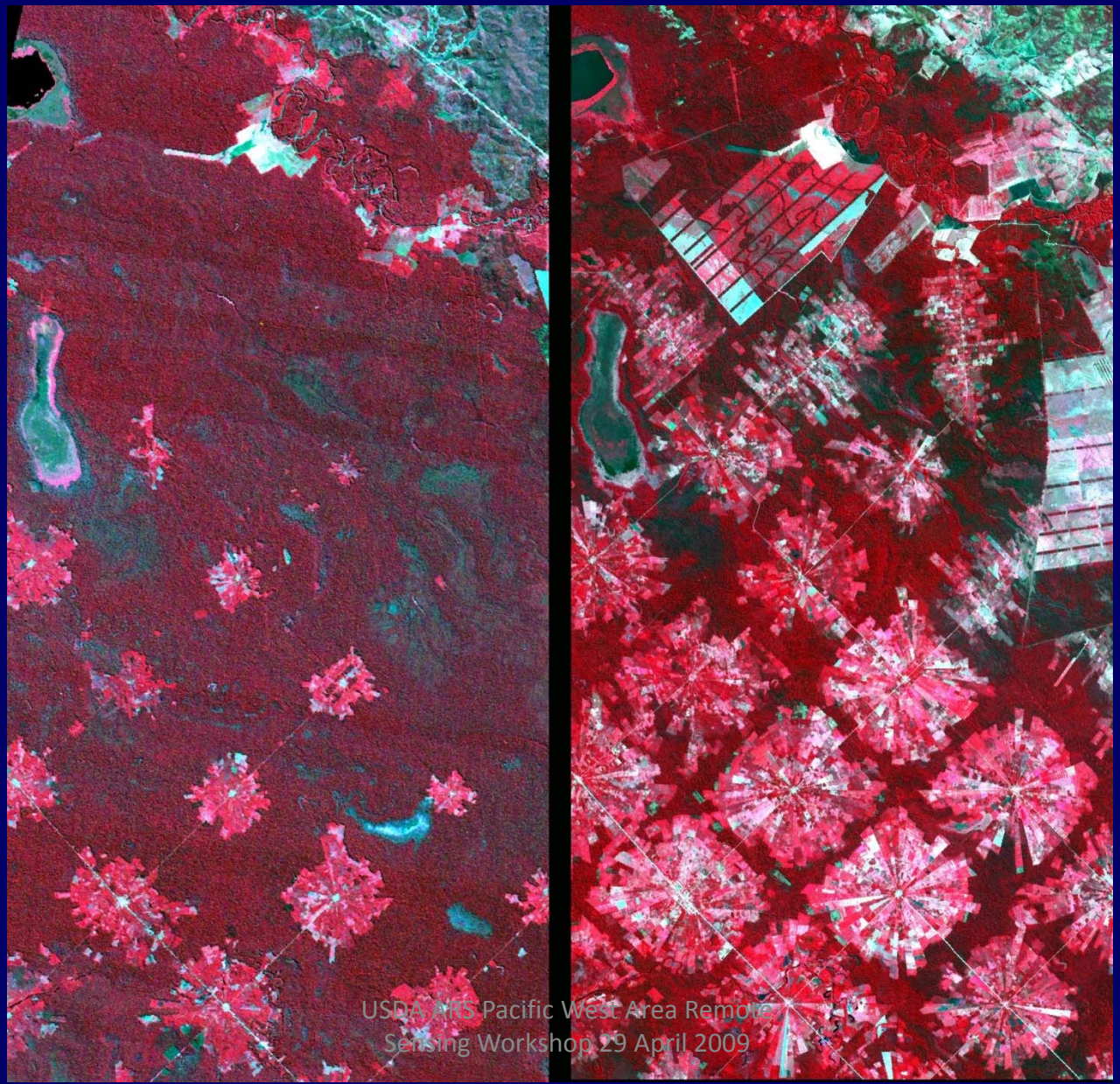
US-Mexico Border, Mexicali



Area around Iguazu Falls



Santa Cruz de la Sierra, Bolivia: 1986 & 2001

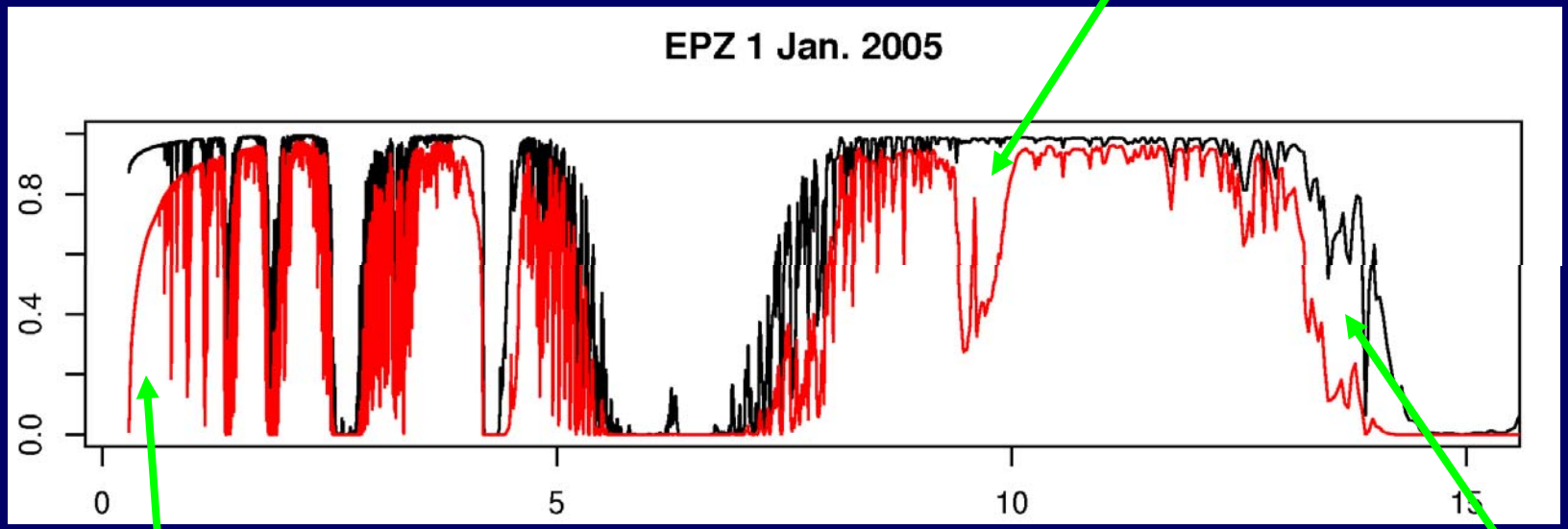


ASTER Overview

- 14 Spectral bands visible to thermal bands
- Unique features:
  - Multispectral TIR & SWIR*
  - Stereo-viewing: DEM generation
- Resolution 15-90 m
- hdf4 format
- *On-demand imagery & not free (but not $$ either) except for NASA-affiliated researchers, DAR Process*
- asterweb.jpl.nasa.gov

MODIS & ASTER QUSTIONS & DISCUSSION

Spectral Atmospheric Transmissivity



Black: 300 m above the ground
Red: 700 km altitude (orbit)