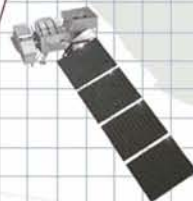
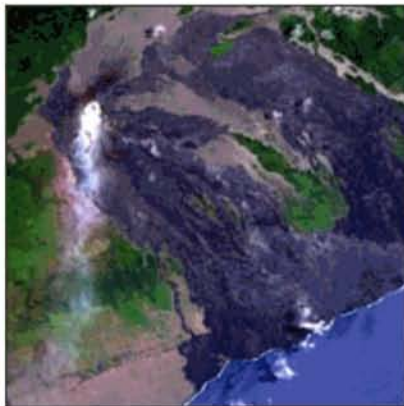


Working with Landsat Data

A Landsat Education and Public Outreach Presentation





What?



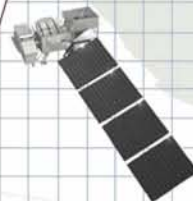
Why?



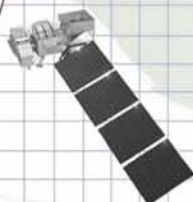
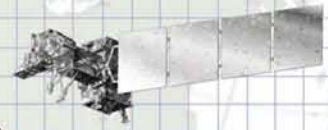
Where?



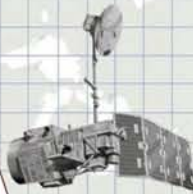
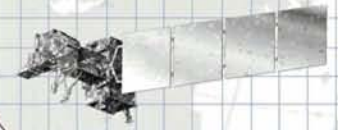
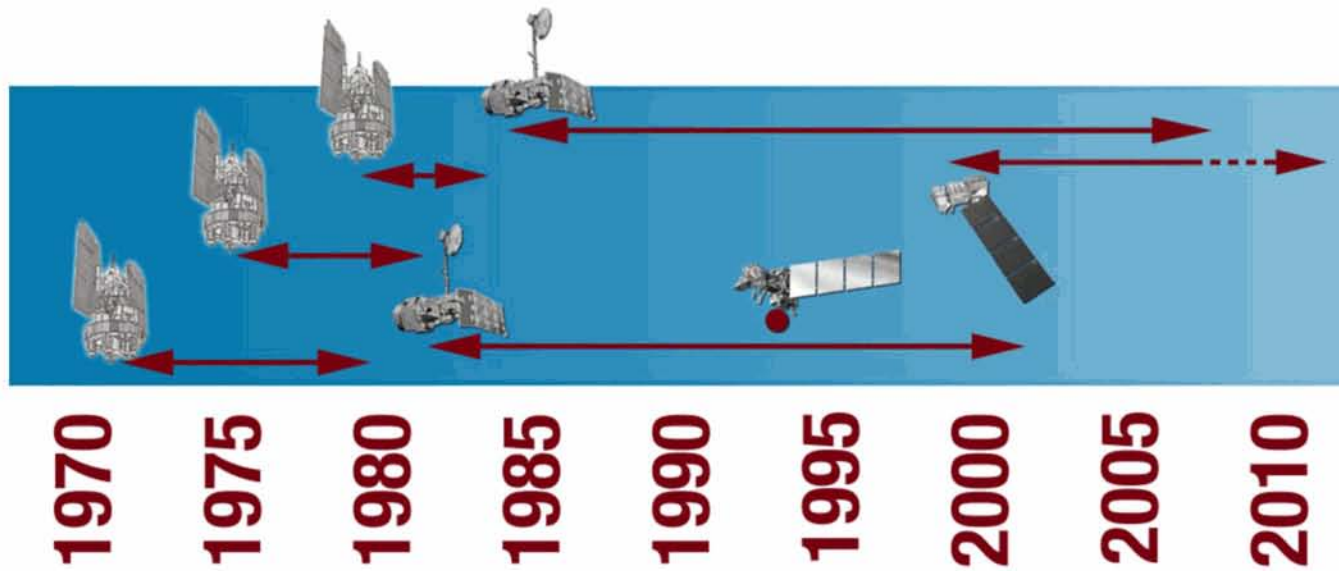
How?



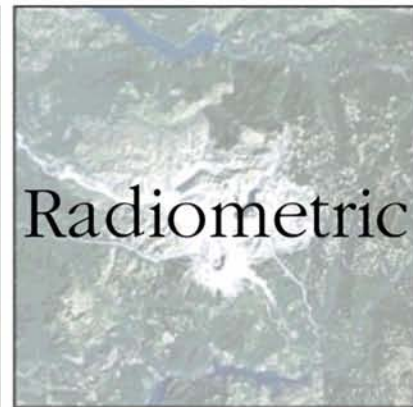
what?



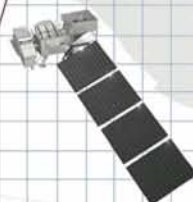
Welcome to the Landsat dynasty, 1972-



Describing remotely sensed imagery



Resolution



Spectral Resolution

MSS Bands

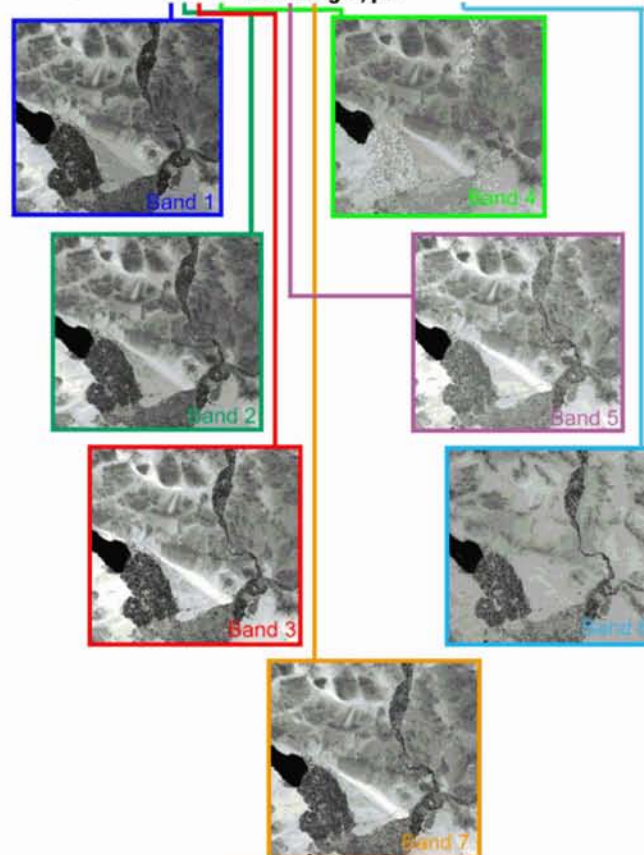
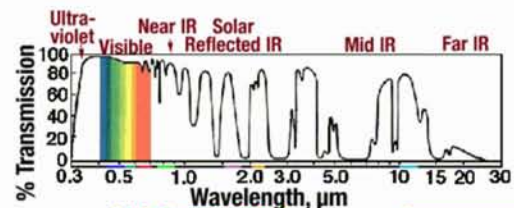
Band Number (L1-L3)	Band Number(L4-L5)	μm	Resolution
4	1	0.5-0.6	80 m
5	2	0.6-0.7	80 m
6	3	0.7-0.8	80 m
7	4	0.8-1.1	80 m
8	n/a	10.41-12.6	237 m

TM Bands

Band Number	μm	Resolution
1	0.45-0.53	30 m
2	0.52-0.60	30 m
3	0.63-0.69	30 m
4	0.76-0.90	30 m
5	1.55-1.75	30 m
6	10.4-12.5	120 m
7	2.08-2.35	30 m

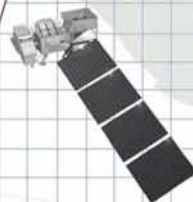
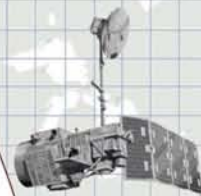
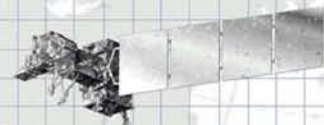
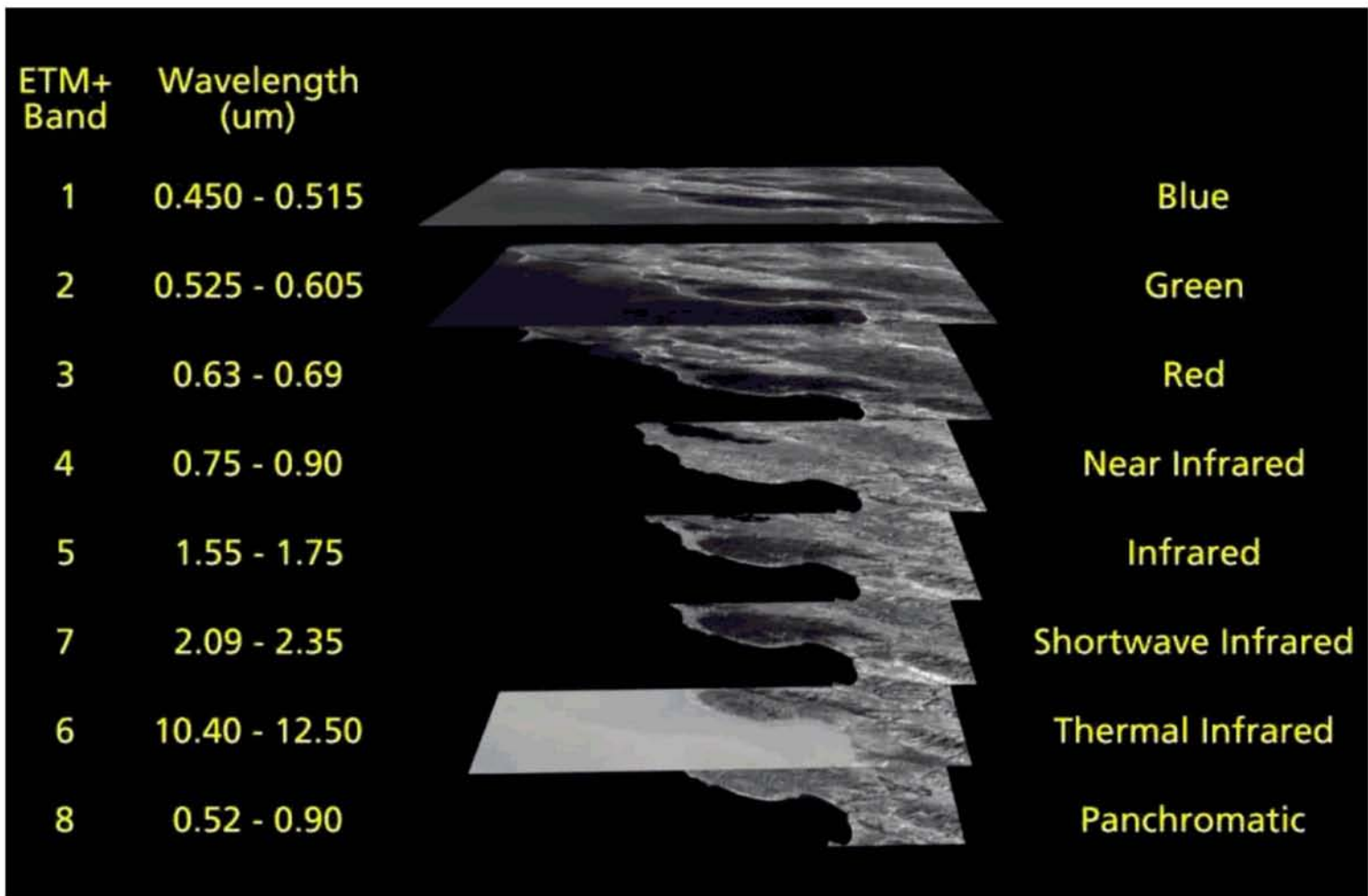
ETM+ Bands

Band Number	μm	Resolution
1	0.45-0.515	30 m
2	0.525-0.605	30 m
3	0.63-0.69	30 m
4	0.75-0.90	30 m
5	1.55-1.75	30 m
6	10.4-12.5	60 m
7	2.09-2.35	30 m
8	0.52-0.9	15 m

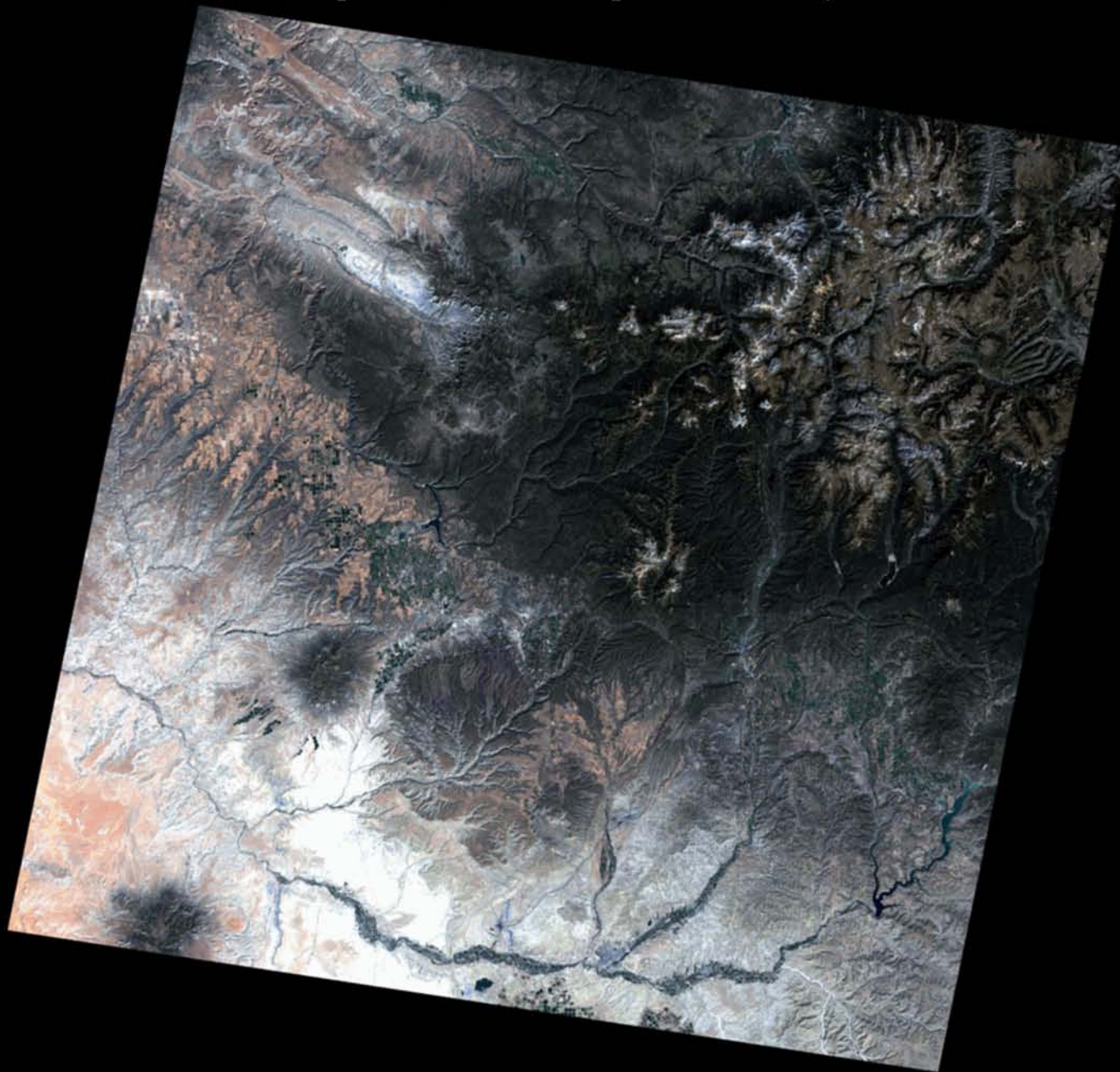


Electromagnetic Spectrum Image from Virtual Hawaii.

Spectral Resolution

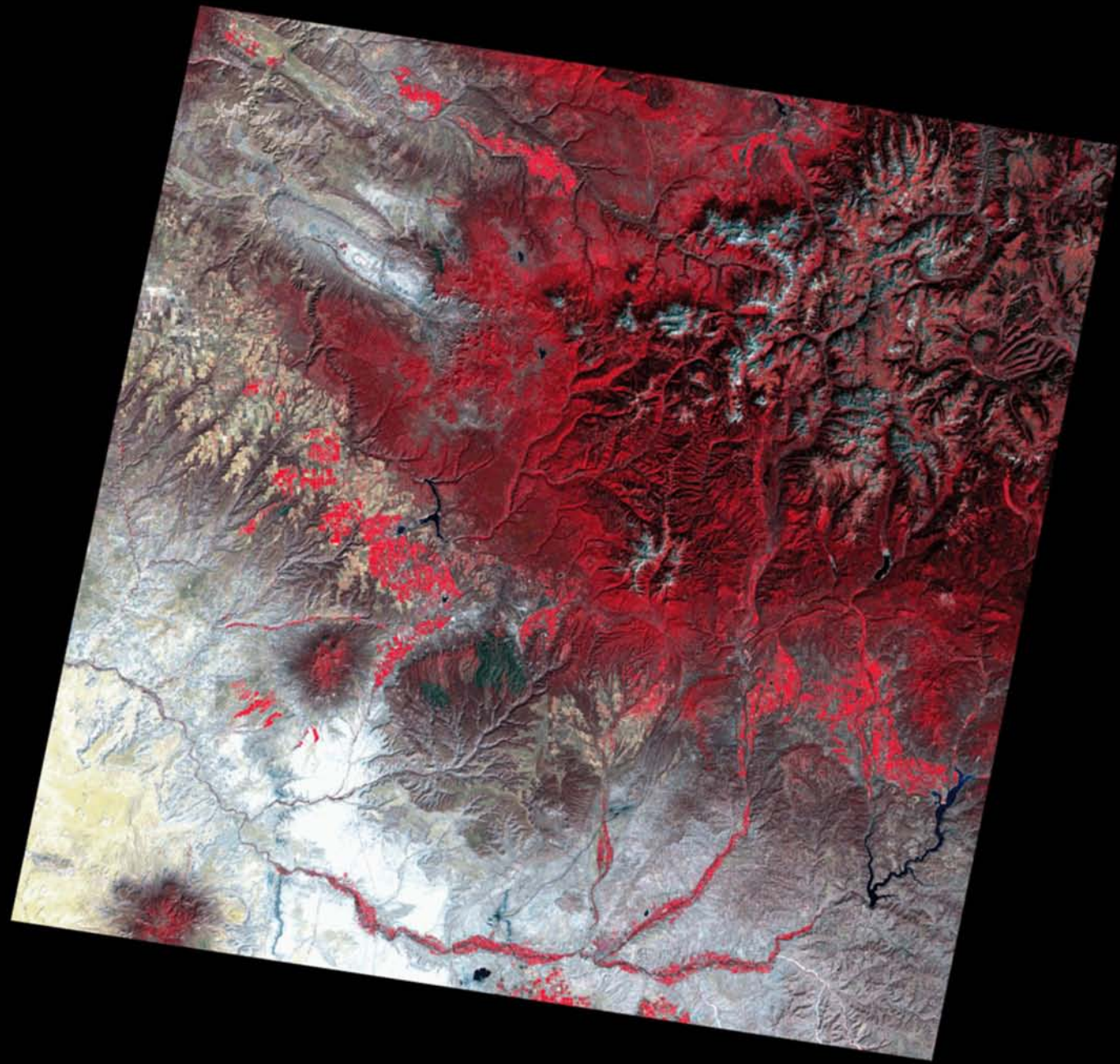


Landsat 7, Path 35 Row 34, Sept. 12, 2000; acquired shortly after 2000 Mesa Verde fire



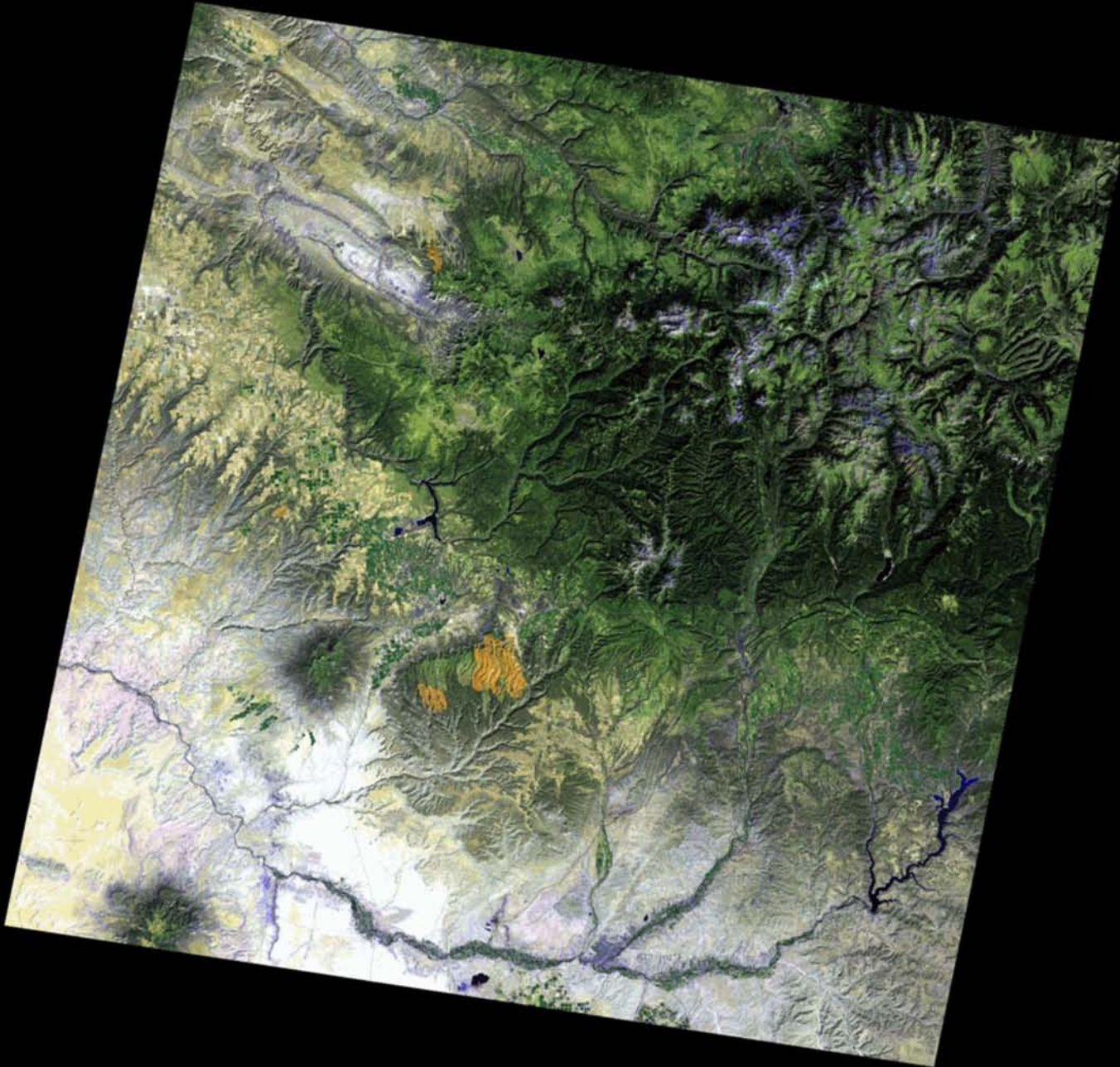
Different band combinations highlight different features, this image uses bands: 3,2,1

Can you see the fire scar?



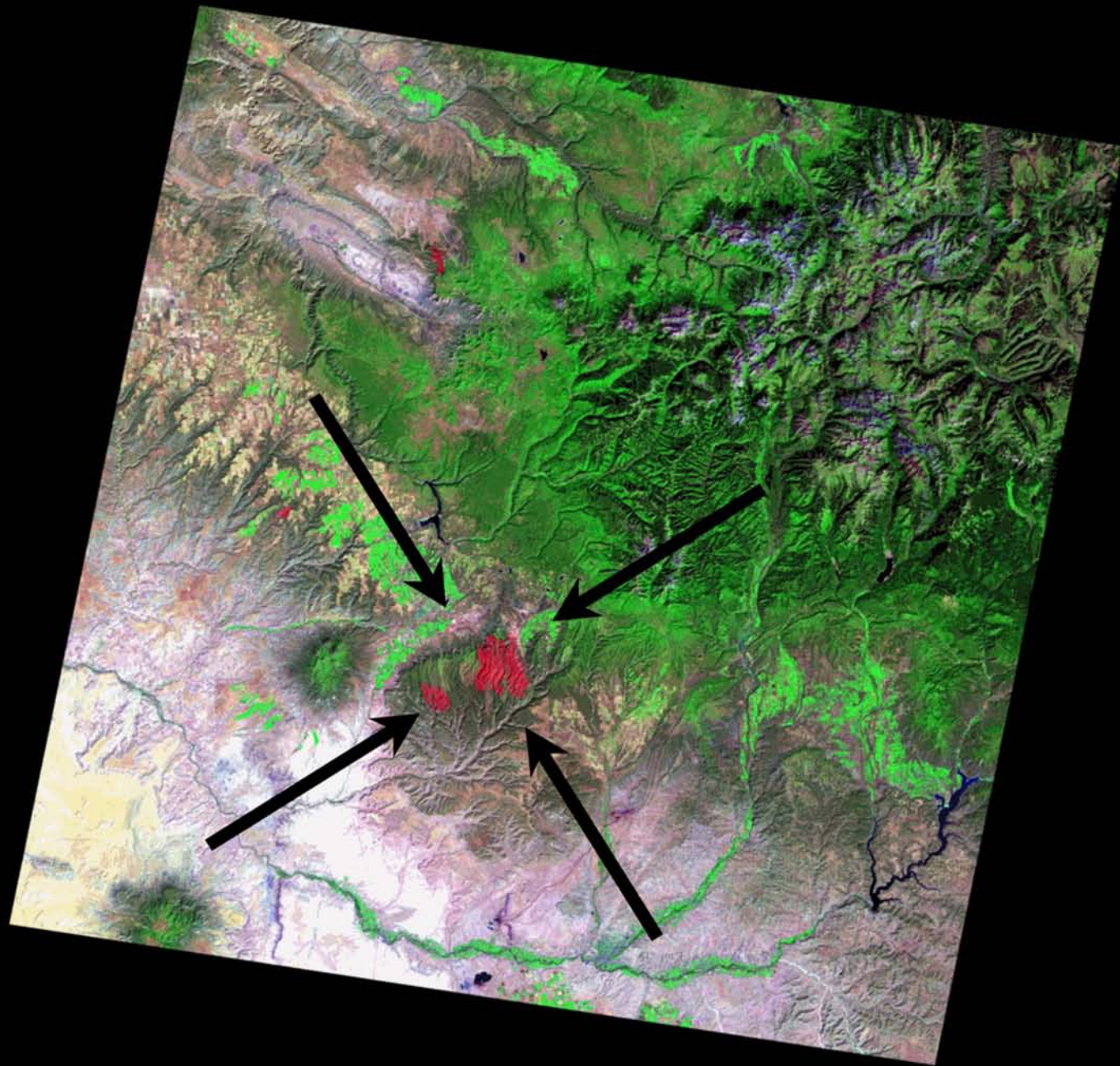
Different band combinations highlight different features, this image uses bands: 4,3,2

Can you see the fire scar now?



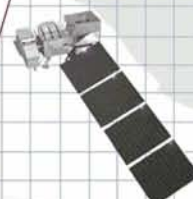
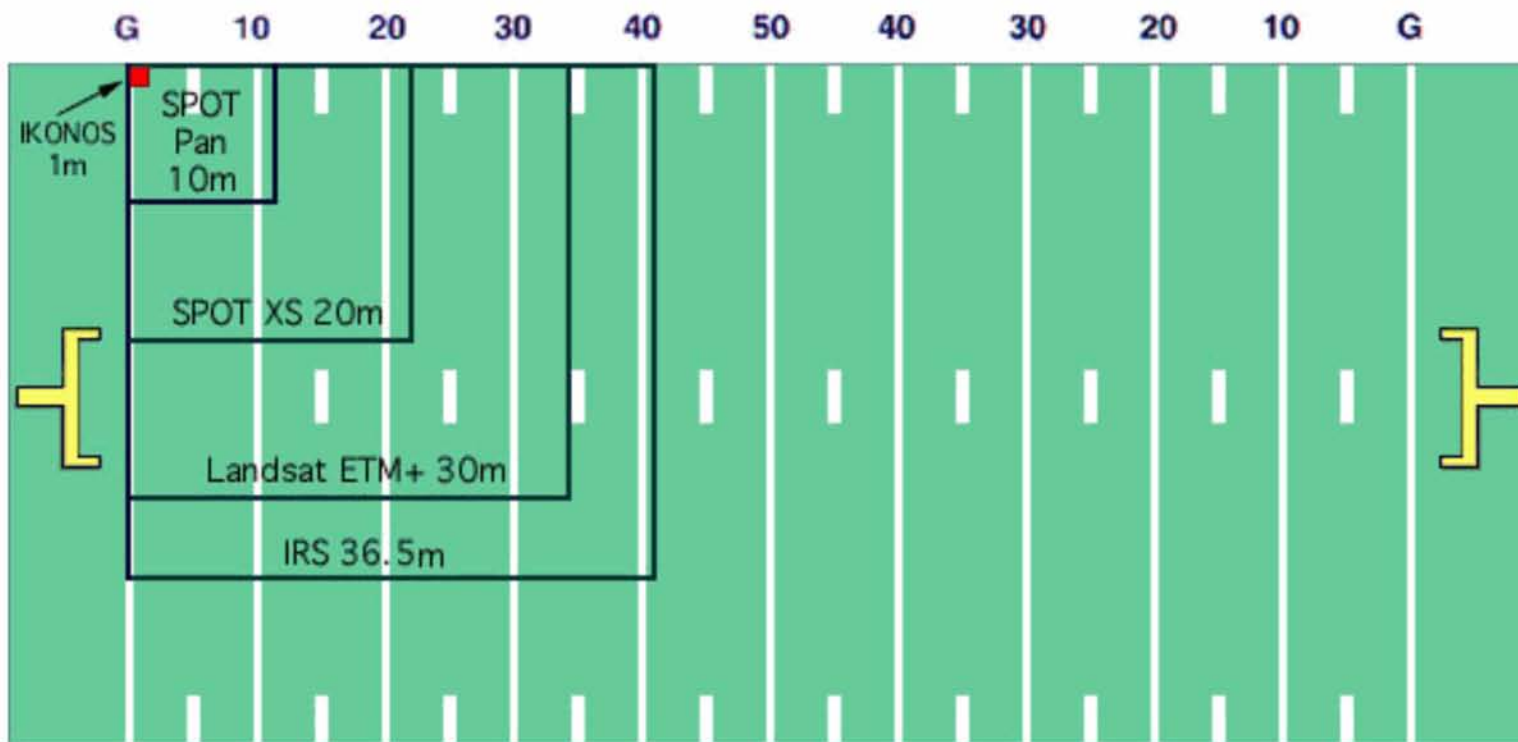
Different band combinations highlight different features, this image uses bands: 7,5,2

How about now?



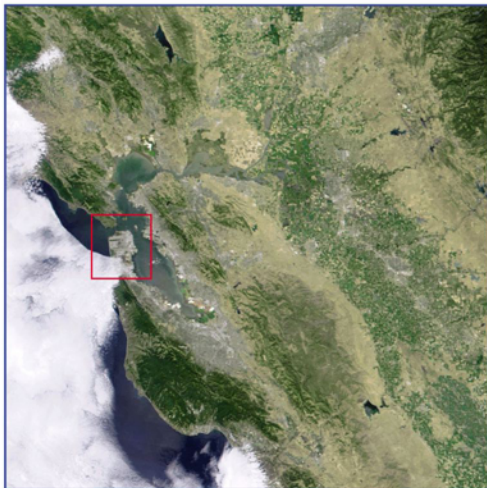
Different band combinations highlight different features, this image uses bands: 7,4,2

Spatial Resolution



Spatial Resolution

MODIS



250 m

Landsat-7

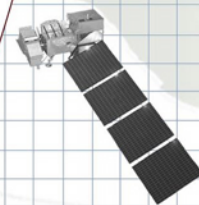
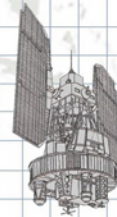
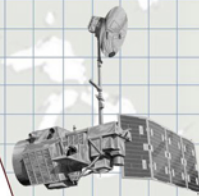
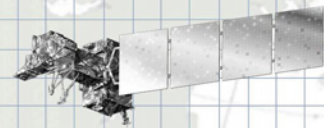
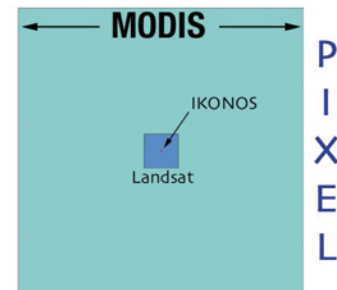


30 m

IKONOS

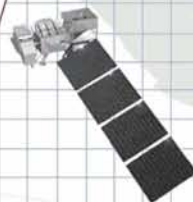
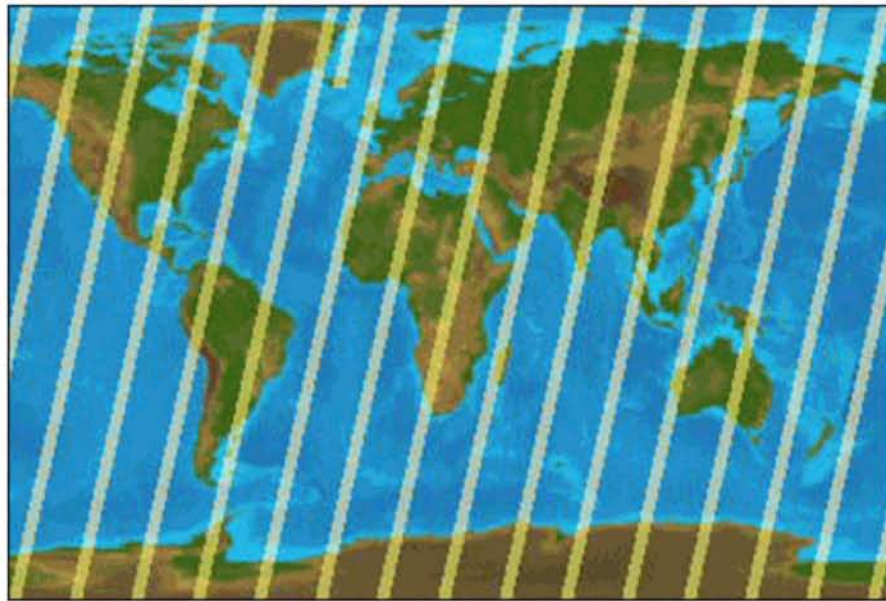


1 m

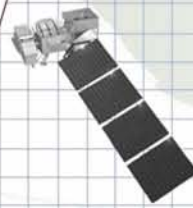
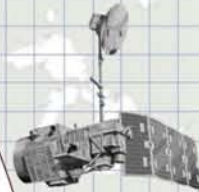
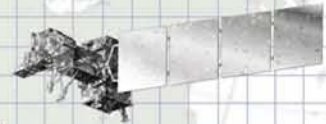


Temporal Resolution

- Landsats 4, 5, and 7 all have/had a 16 day repeat cycle
- Landsat 1, 2, and 3 had an 18 day repeat cycle
- Landsat 5 and 7 eight days apart, (see on Glovis)

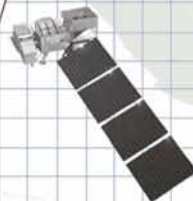
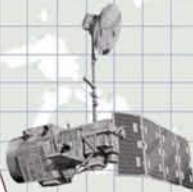
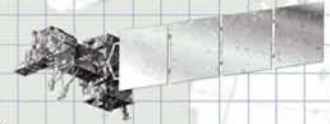
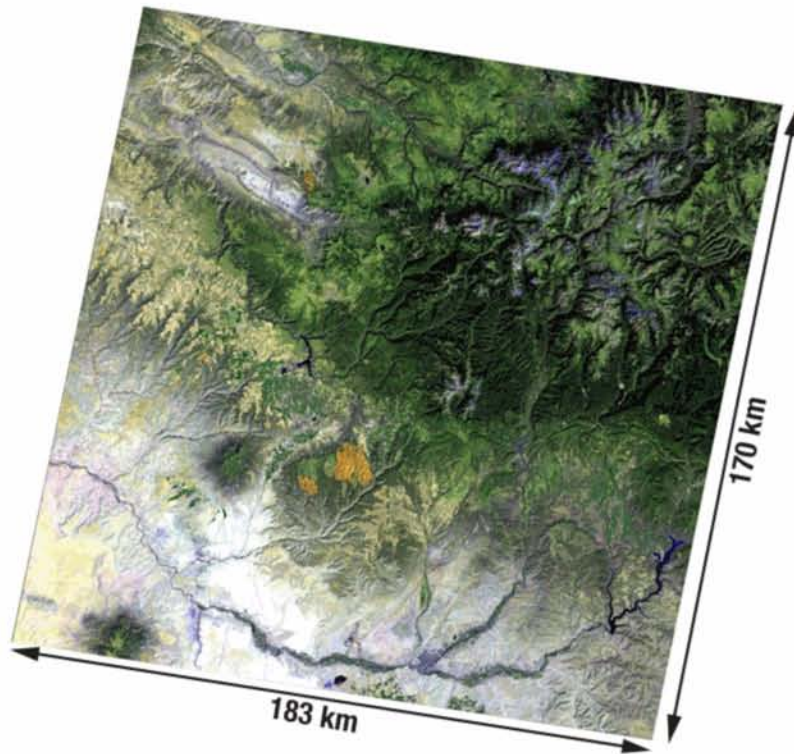


why?



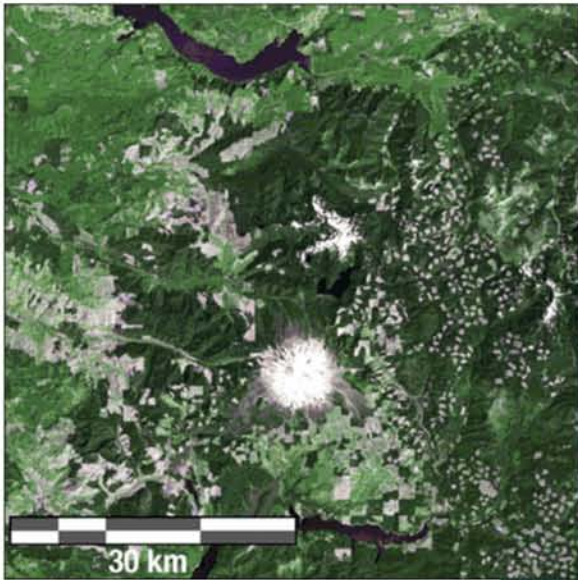
The Landsat niche

- A mid-resolution satellite
- Affords a synoptic view (and is coarse enough for global coverage)
- Yet detailed enough to characterize human scale processes, e.g. urban growth

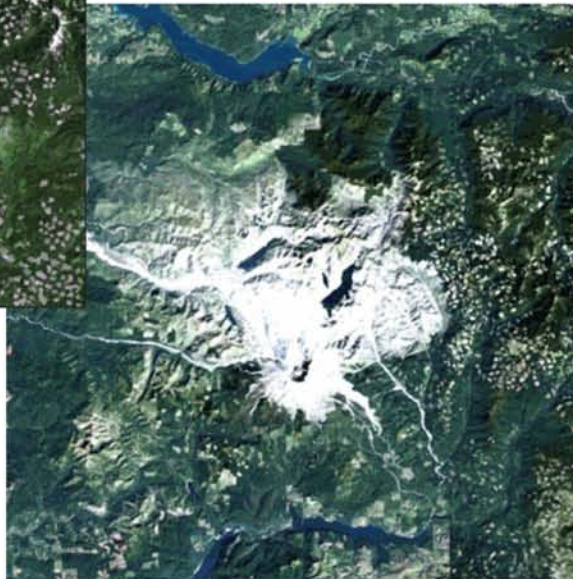


Depth of the Landsat archive

- Landsat has been collecting data for 34 years!



1973

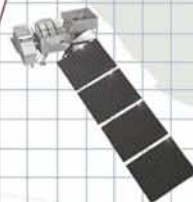
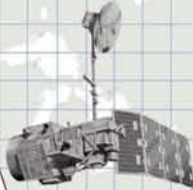
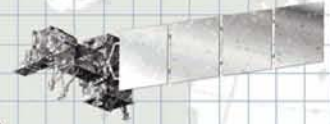


1990



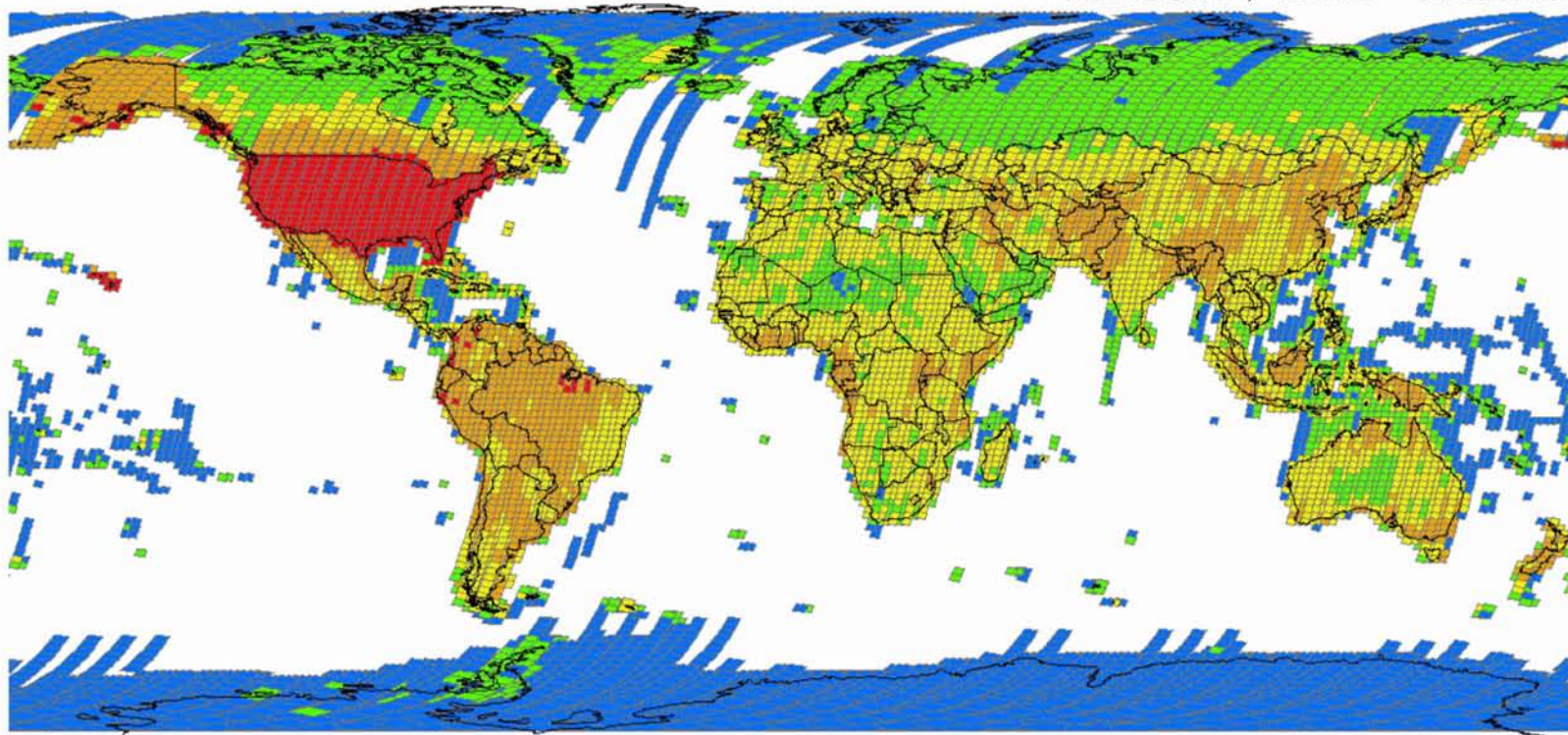
1999

Mt. St. Helens



Depth of the Landsat archive

Landsat 7 ETM+ archive



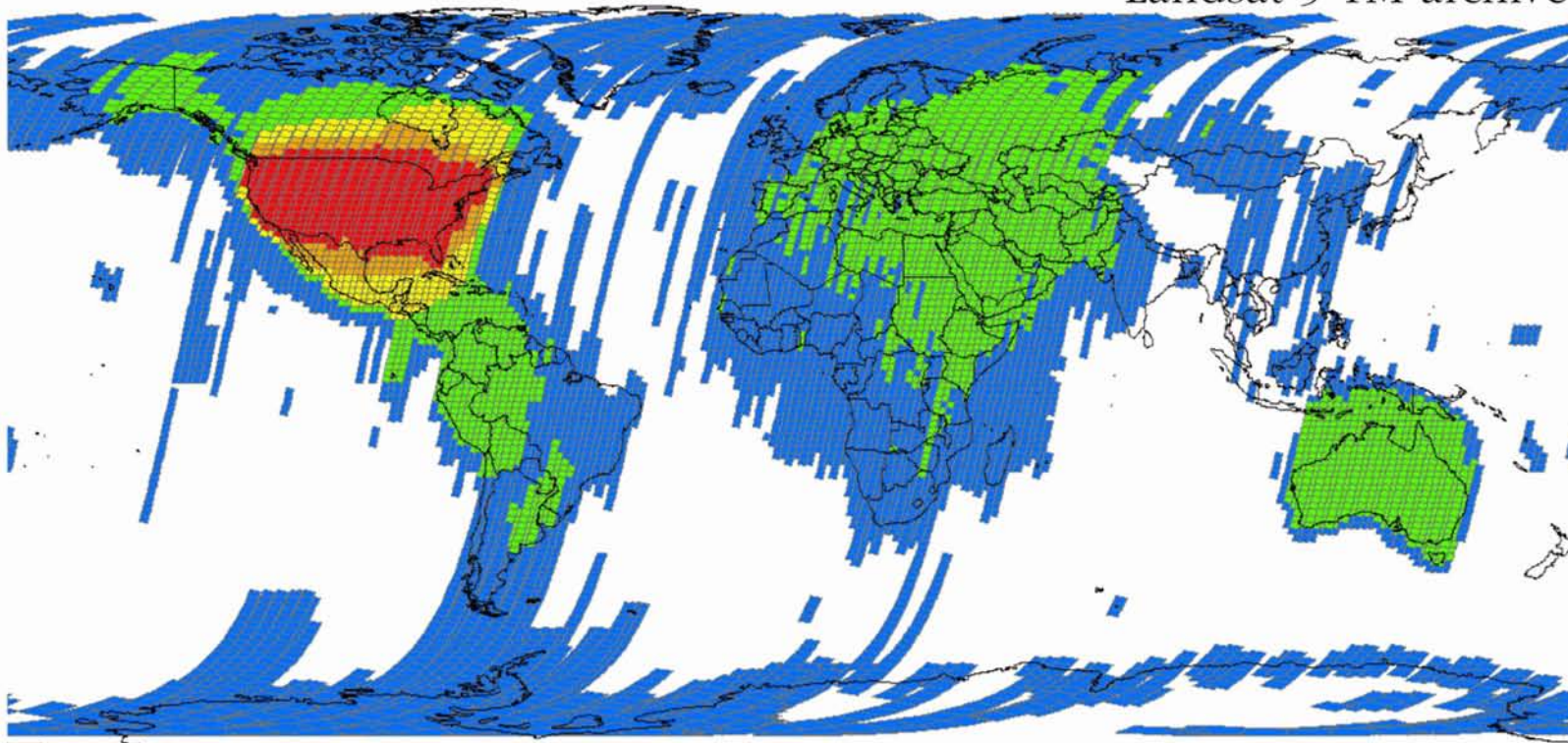
Full scenes archived in LAM
29 June 1999 through 30 September 2005

1 - 19 20 - 43 44 - 67 68 - 107 108 - 141

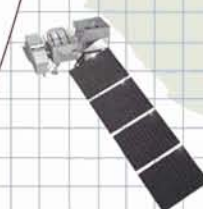
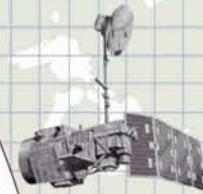
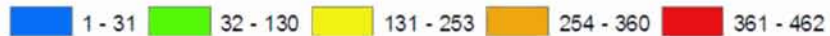


Depth of the Landsat archive

Landsat 5 TM archive

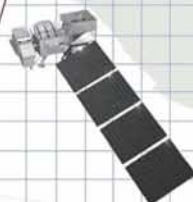
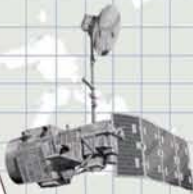
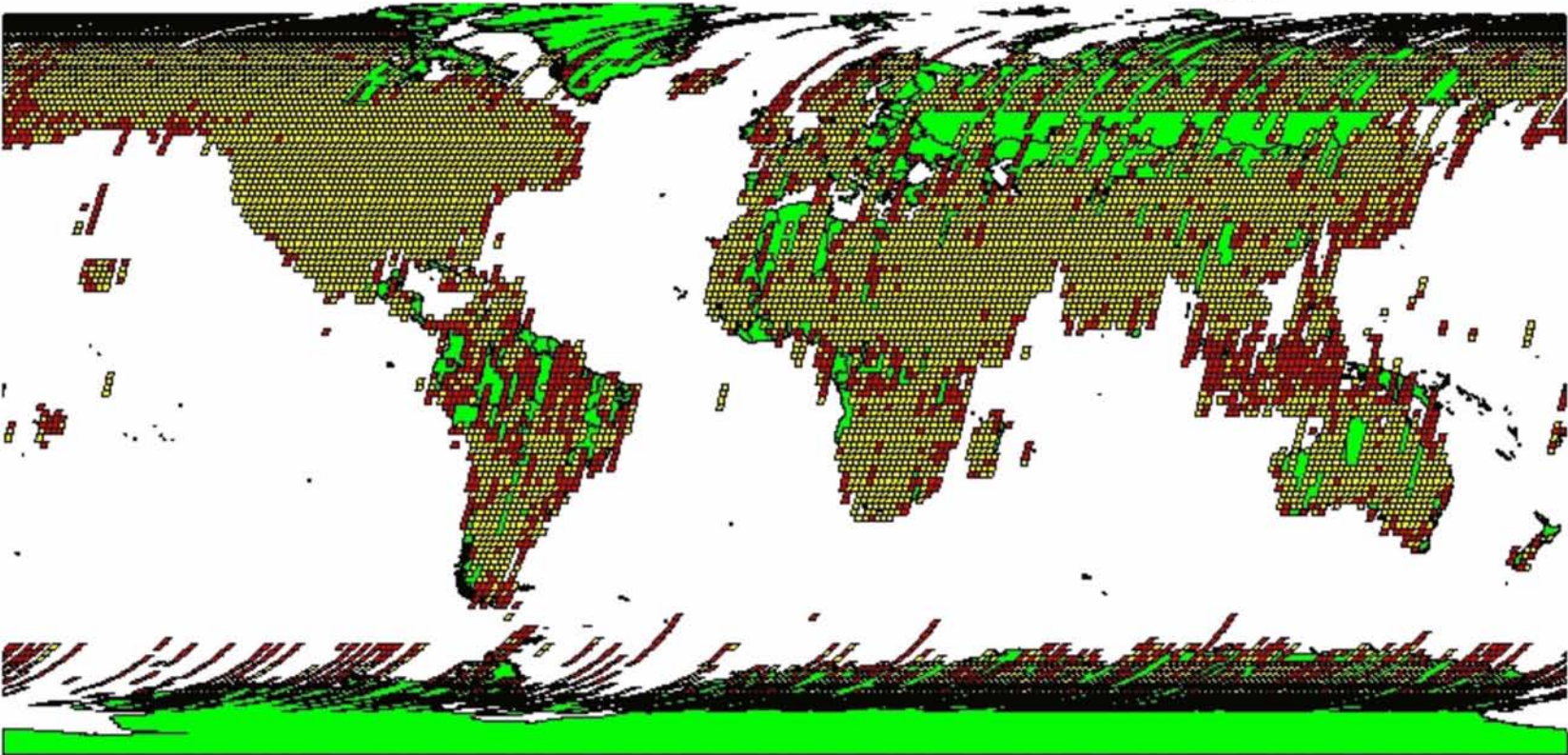


Full scenes archived in LAM
through 30 September 2005



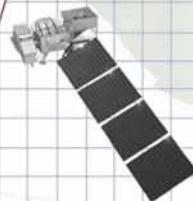
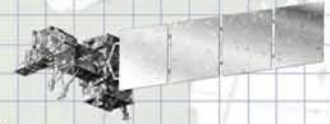
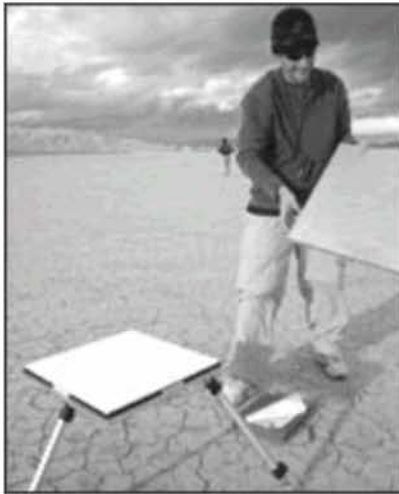
Depth of the Landsat archive

1973 MSS archive

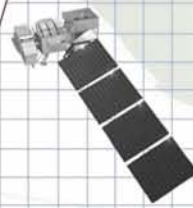
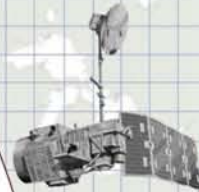


Landsat calibration standards


Landsat-7's rigorous calibration standards have made it the validation choice for many coarse-resolution sensors.



where?



Ordering Landsat data



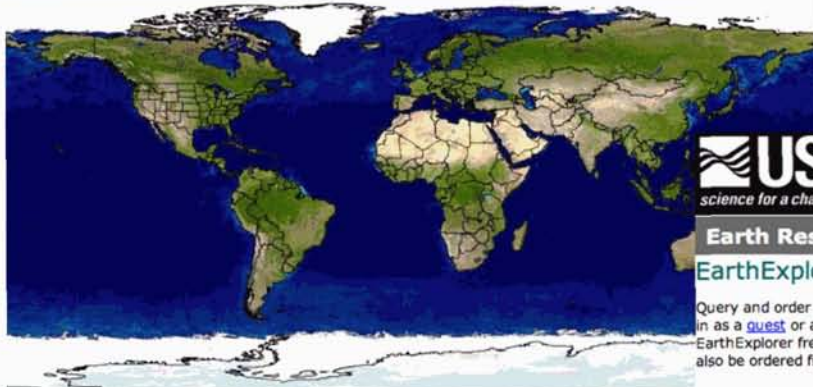
USGS
science for a changing world

Center for Earth Resources Observation & Science (EROS)

USGS Global Visualization Viewer
Select a Sensor, then click on the Global Locator Map to view satellite browse images in that area.

Latitude Longitude Select Sensor Landsat

USGS Glovis
<http://glovis.usgs.gov>



USGS
science for a changing world

Earth Resources Observation & Science (EROS)
EarthExplorer

USGS Home
Contact USGS
Search USGS

Query and order **satellite images**, **aerial photographs**, and **cartographic products** through the U.S. Geological Survey. In as a [guest](#) or as a [registered user](#). Registered users have access to more features than guests do. If you plan on using EarthExplorer frequently, you may wish to register. Please note that this site uses [Session Cookies](#). All products on this site can also be ordered from [Customer Services](#).

What's New!	Browser Requirements	Help	Download
Quick Start Guide	About Browse Images	Forum	
DOI	USGS HOME	Biology	Geology
		Mapping	

U.S. Department of the Interior | U.S. Geological Survey (USGS)
Please read this general [Disclaimer](#).
URL: <http://Glovis.usgs.gov/Browse/Browse.shtml>
Maintainer: glv@usgs.gov email to: glv@usgs.gov
Last Update: Thursday, 26-Jan-2006 11:00:12 CST
[USGS Privacy Statement](#) [Accessibility](#)



Enter as a: [GUEST](#) Or [REGISTER](#)

If you are already a registered user please enter your login information here:
User Name: Password: [LOGIN](#) [RESET](#)

[Forgot your password?](#)

Just looking for a photo? Try [PhotoFinder](#) Just looking for a map? Try [USGS Store](#)

Accessibility FOIA Privacy Policies and Notices

U.S. Department of the Interior | U.S. Geological Survey
URL: <http://earthexplorer.usgs.gov/>
Page Contact Information: earthexplorer@usgs.gov
Page Last Modified: 04/28/2005

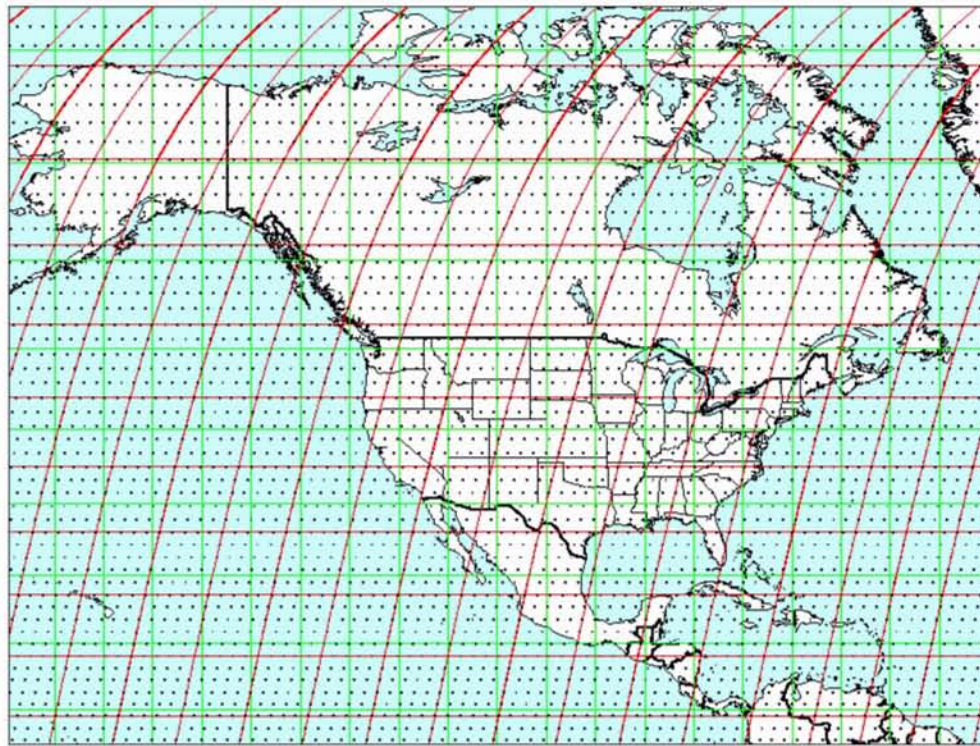


USGS EarthExplorer
<http://earthexplorer.usgs.gov>



WRS and Landsat data policy

- Data Policy: Cost Of Fulfilling User Request (COFUR)
- Each scene has a unique WRS Path/Row locator



Each red line indicates a Landsat orbital **Path**
Each dot indicates a scene center, denoted as **Row**



Reduced cost Landsat data

Global Land Cover Facility

About GLCF Research Data & Products Gallery Library Services Contact Site Map

Search GLCF:

Welcome

The GLCF is a center for land cover science with a focus on research using remotely sensed satellite data and products to assess land cover change for local to global systems.

Quick Links

- GLCF FAQs
- UMD MODIS Research
- GFC-GOLD
- Landsat GeoCover
- SRTM DEM GeoTIFFs
- Rapid Response
- IUCN Protected Areas

Download Data

Search, browse and download free online data using ESDI

Available Scenes

Landsat Scenes: 28558
MODIS Composites: 235
ASTER Scenes: 803
Total Size: 13 Terabytes

Contribute Data

Share satellite imagery and imagery-derived products with your colleagues via our holdings.

**** Help Us Help You! ****

News

- Air & Space Museum series features Dr. John Townshend(2006.03.14)
- GLCF Presentations at the 2006 AAG Meeting(2006.03.7-11)
- GLCF at the Federation of ESIPs Winter Meeting(2006.01)
- MSS for Amazon Research(2005.12.07)
- GLCF Advisory Committee Meeting(2005.11.02)
- Dr. John Townshend Wins 2005 William T. Pecora Award(2005.10.26)

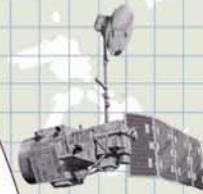
E-mail: glcf@umiacs.umd.edu 3166 A.V. Williams Building - College Park, Maryland 20742

Copyright © 1997-2006 University of Maryland. All rights reserved.

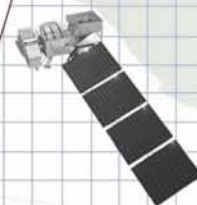
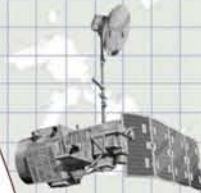
National Aeronautics and Space Administration UNIVERSITY OF MARYLAND University of Maryland Department of Geography Institute for Advanced Computer Studies

<http://glcf.umiacs.umd.edu/index.shtml>

- Because of Landsat's data policy there are a number of websites that provide Landsat data for a reduced cost or free.
- The University of Maryland's Global Land Cover Facility is one of the best.
- GLCF has all of the orthorectified GeoCover scenes

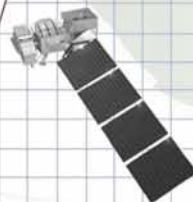


How?



Landsat applications

- Land cover classification
- Land cover change
- Estimation of irrigation water use
- Wildlife habitat mapping
- Burn severity mapping
- Rangeland management



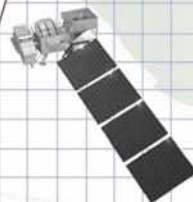
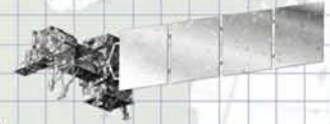
Analyzing Landsat Data

Image processing software:

- RSI ENVI
- PCI Geomatics
- ERDAS Imagine
- MultiSpec (see resource page)
- ArcGIS extensions: Image Analysis

Common analysis methods:

- Band ratios: NDVI, VI, BARC
- Supervised classification
- Unsupervised classification



Landsat data in ArcGIS

Many people use Landsat data and a Geographic Information System (GIS) together

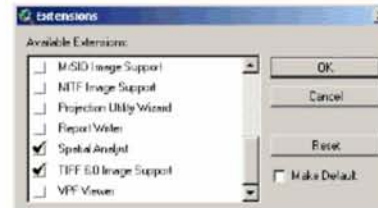



Loading and enhancing Landsat images in common geospatial software

There are several GIS and Remote Sensing software packages that are commercially available. Each of these programs is capable of loading and enhancing satellite images, but there are differences in the way that these images are handled. Below are some practical guides to loading and enhancing Landsat imagery in three commonly used, commercially available GIS and Remote Sensing software packages.

ArcView 3.x

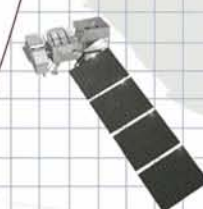
1. In an open ArcView project, open the extensions list by choosing *Extensions...* from the *File* drop down menu. Make sure that *Spatial Analyst* and *TIFF 6.0 Image Support* are selected to work with tif images and raster data.



2. To add an image to the project, use the add theme button . Find and select the image that you would like to view. ArcView 3.x is able to view satellite image data in tif, erdas img, esri grid and bil formats. Be sure to set the *Data Source Type* to *Image Data Source* to view the available image files.



A tutorial by
Ned Horning
American Museum
of Natural History



Landsat

Resources

Landsat NASA website landsat.gsfc.nasa.gov

Landsat USGS website landsat.usgs.gov

Landsat 7 Data Users Handbook

http://www.gsfc.nasa.gov/IAS/handbook/handbook_toc.html

USGS Glovis glovis.usgs.gov

USGS Earth Explorer earthexplorer.usgs.gov

Global Land Cover Facility glcf.umiacs.umd.edu/index.shtml

Center for Biodiversity Conservation RS Guide

[geospatial.amnh.org/remote_sensing/training
/workshop_material/monitor_lcc/presentations.html](http://geospatial.amnh.org/remote_sensing/training/workshop_material/monitor_lcc/presentations.html)

MultiSpec <http://dynamo.ecn.purdue.edu/~biehl/MultiSpec/>

