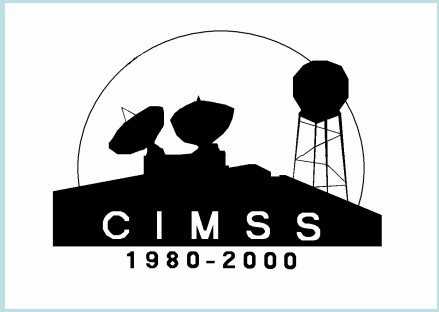
Interrogating MODIS & AIRS data using HYDRA

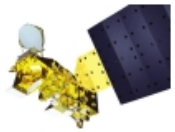


Paul Menzel
NOAA Satellite and Information Services

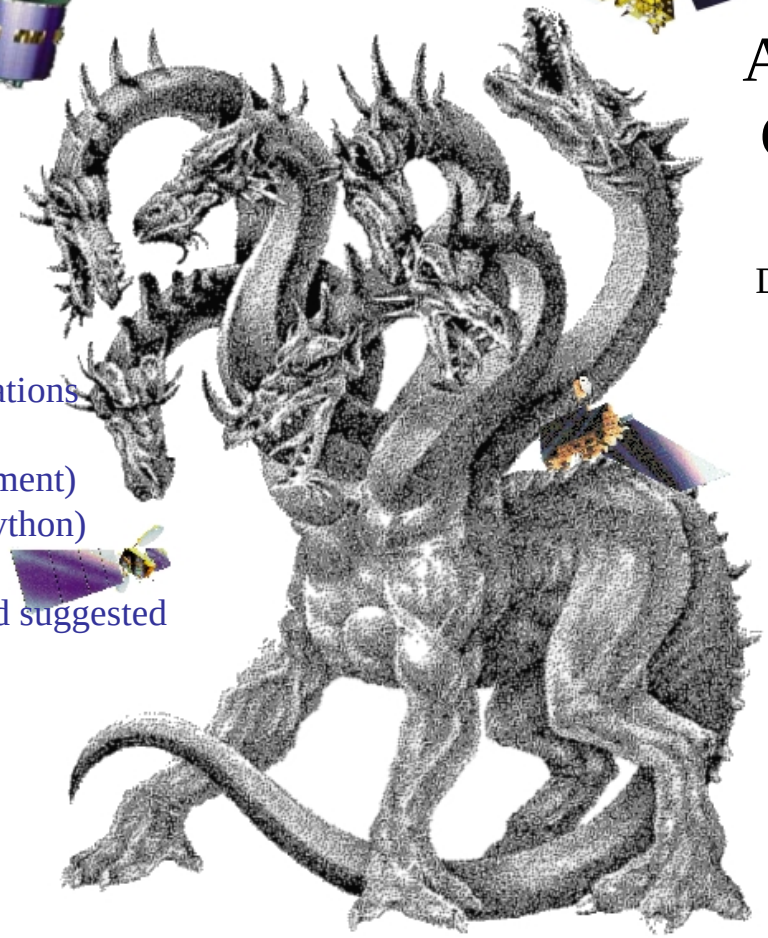
What is HYDRA?
What can it do?
Some examples
How to get it?

HYperspectral viewer for Development of Research Applications - HYDRA

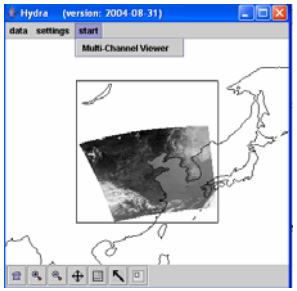
MSG,
GOES



MODIS,
AIRS, IASI
CALIPSO



Freely available software
For researchers and educators
Computer platform independent
Extendable to more sensors and applications
Based in VisAD
(Visualization for Algorithm Development)
Uses Jython (Java implementation of Python)
runs on most machines
512MB main memory & 32MB graphics card suggested
on-going development effort



Developed at CIMSS by
Tom Rink
Tom Whittaker
Kevin Baggett

With guidance from
Paolo Antonelli
Liam Gumley
Paul Menzel
Allen Huang

CIMSS

http://www.ssec.wisc.edu/hydra/

Freely available software
For researchers and educators
Computer platform independent
Extendable to more sensors and applications
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(Visualization for Algorithm Development)
Uses Jython (Java implementation of Python)
runs on most machines
512MB main memory & 32MB graphics card suggested
on-going development effort

http://www.ssec.wisc.edu/hydra/

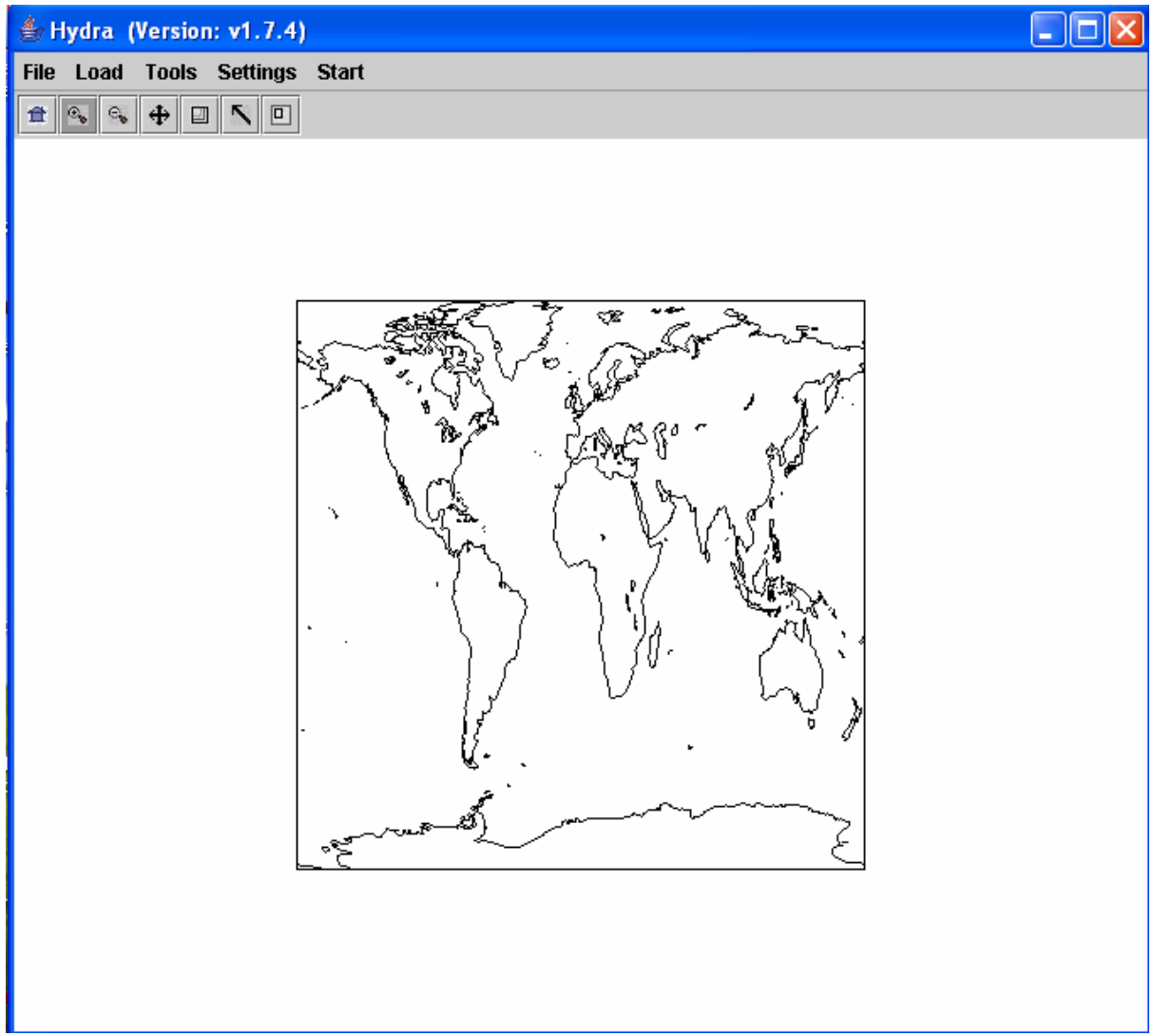
For hydra
http://www.ssec.wisc.edu/hydra/

For MODIS data and quick browse images
http://rapidfire.sci.gsfc.nasa/realtime

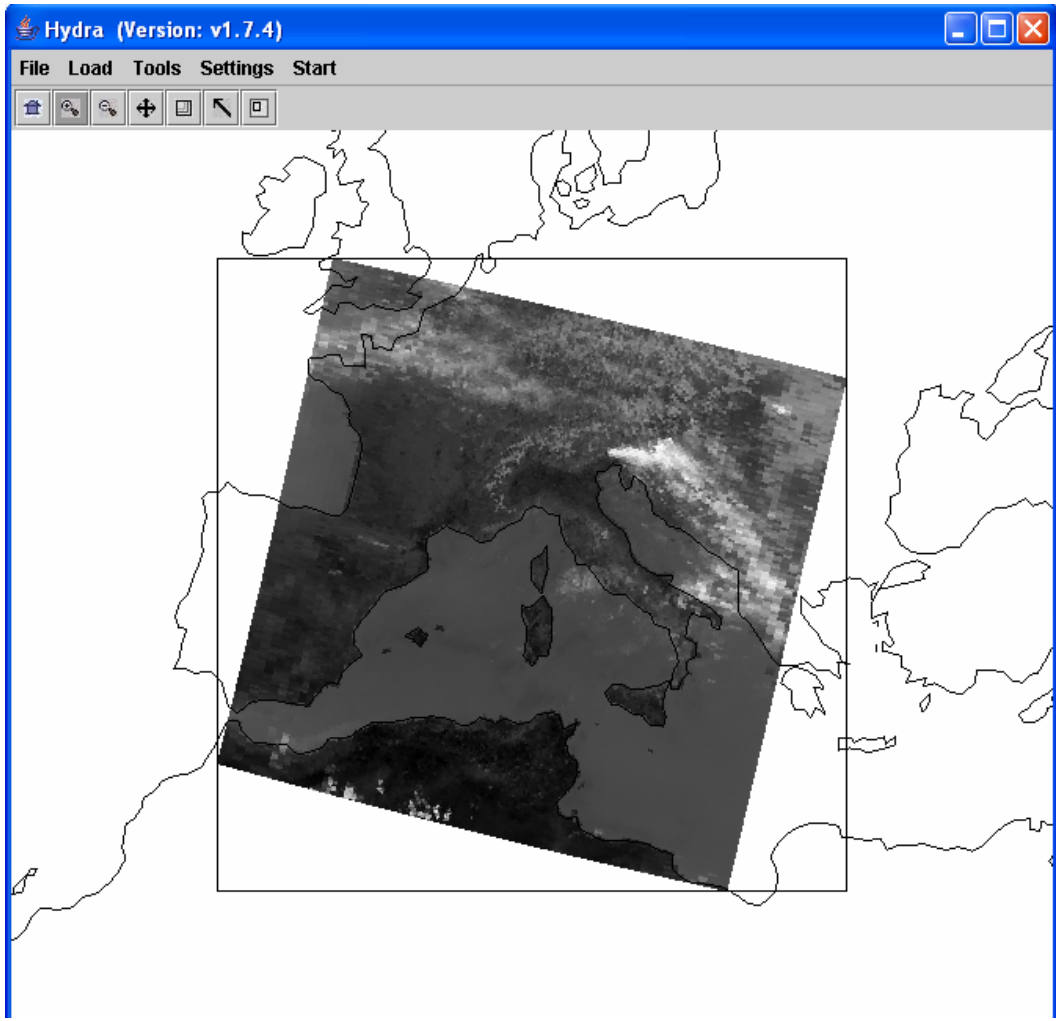
For MODIS data orders
http://ladsweb.nascom.nasa.gov/

For AIRS data orders
http://daac.gsfc.nasa.gov/

The HYDRA Window

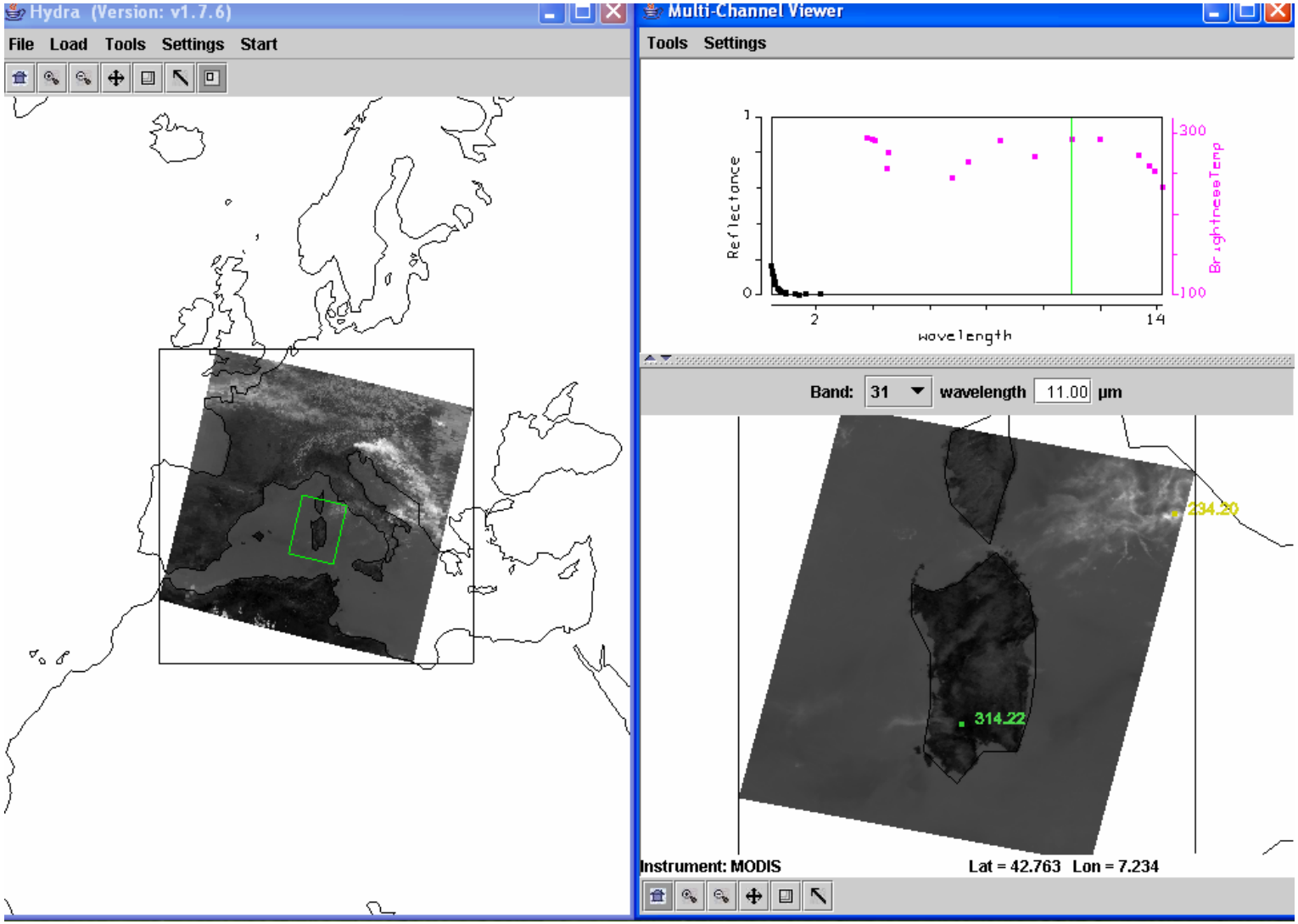


Loading a Granule

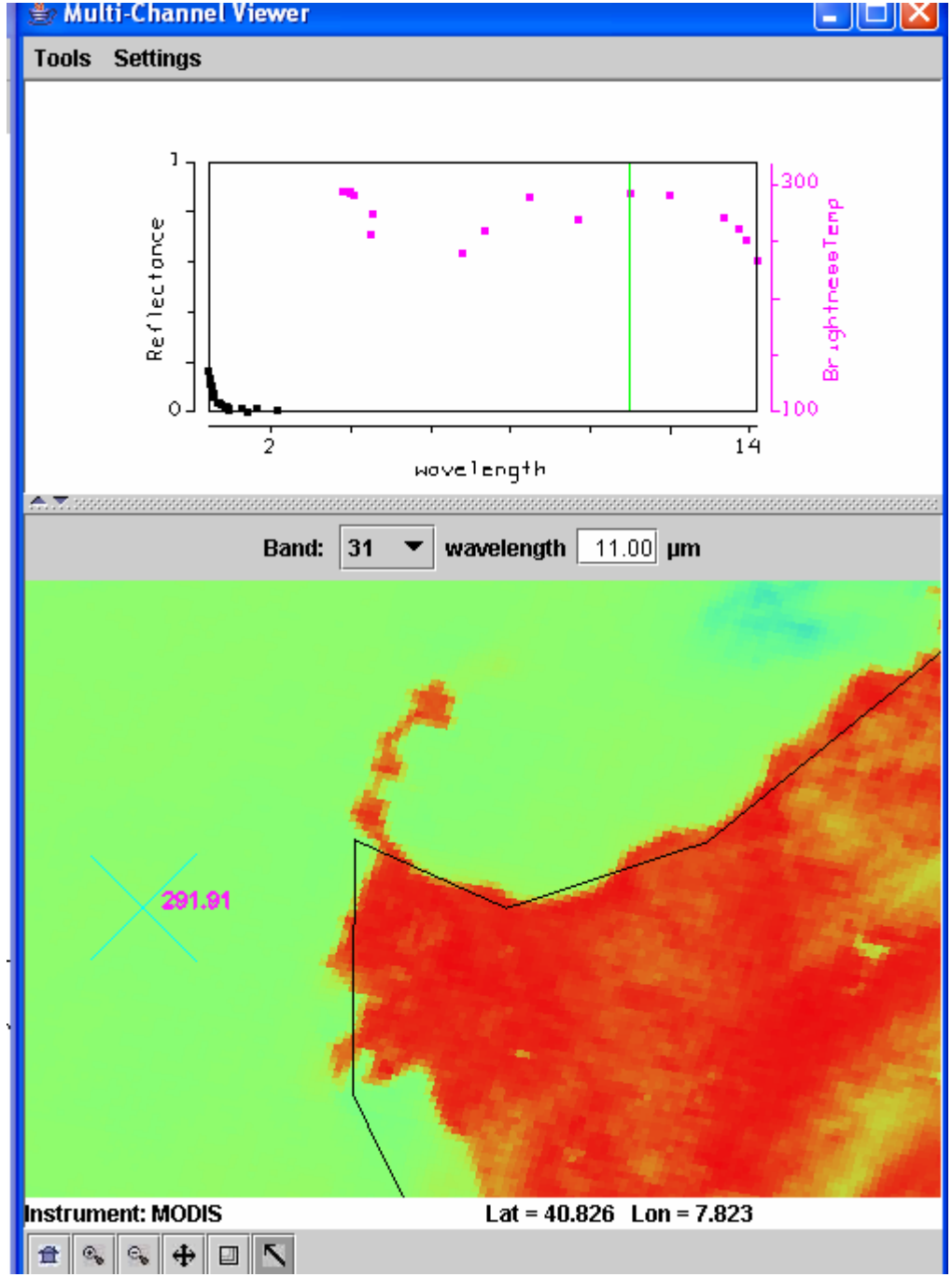


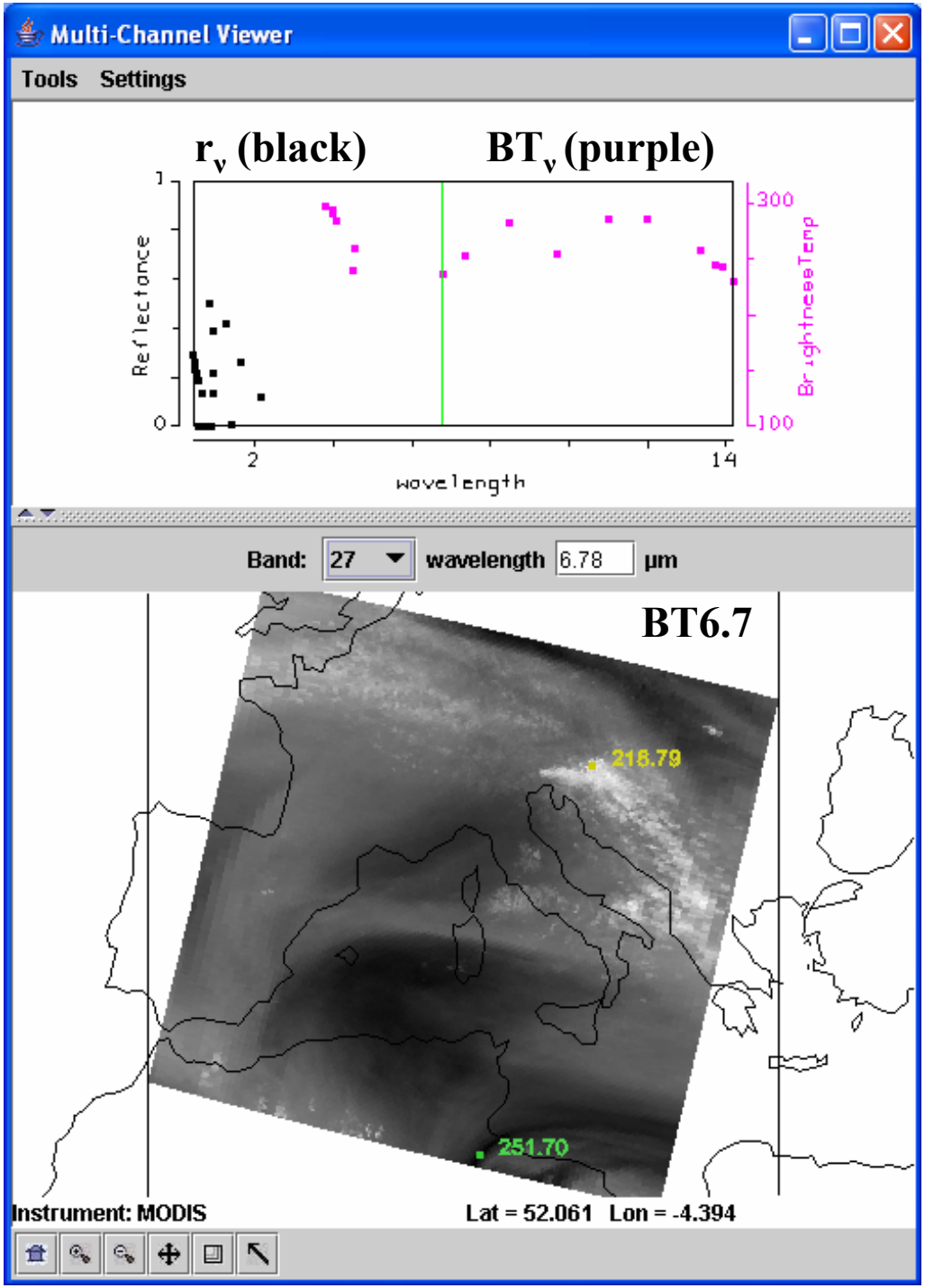
HYDRA IR window with 29 May 2001 MODIS L1B 1KM granule

Select region for full resolution display



Select color
and
Zoom to see
single pixel
resolution





Multichannel Viewer

Under Tools

Linear Combinations opens *Channel Combination Tool* display where you can specify linear combinations of spectral bands a,b,c and d (a +-x / b) +-x / (c +-x / d).

RGB allows you to select a spectral channel for each color in the RGB display

Transect allows you to create a line on the image and see the temperatures or radiances along the transect marked by shift plus right click and drag.

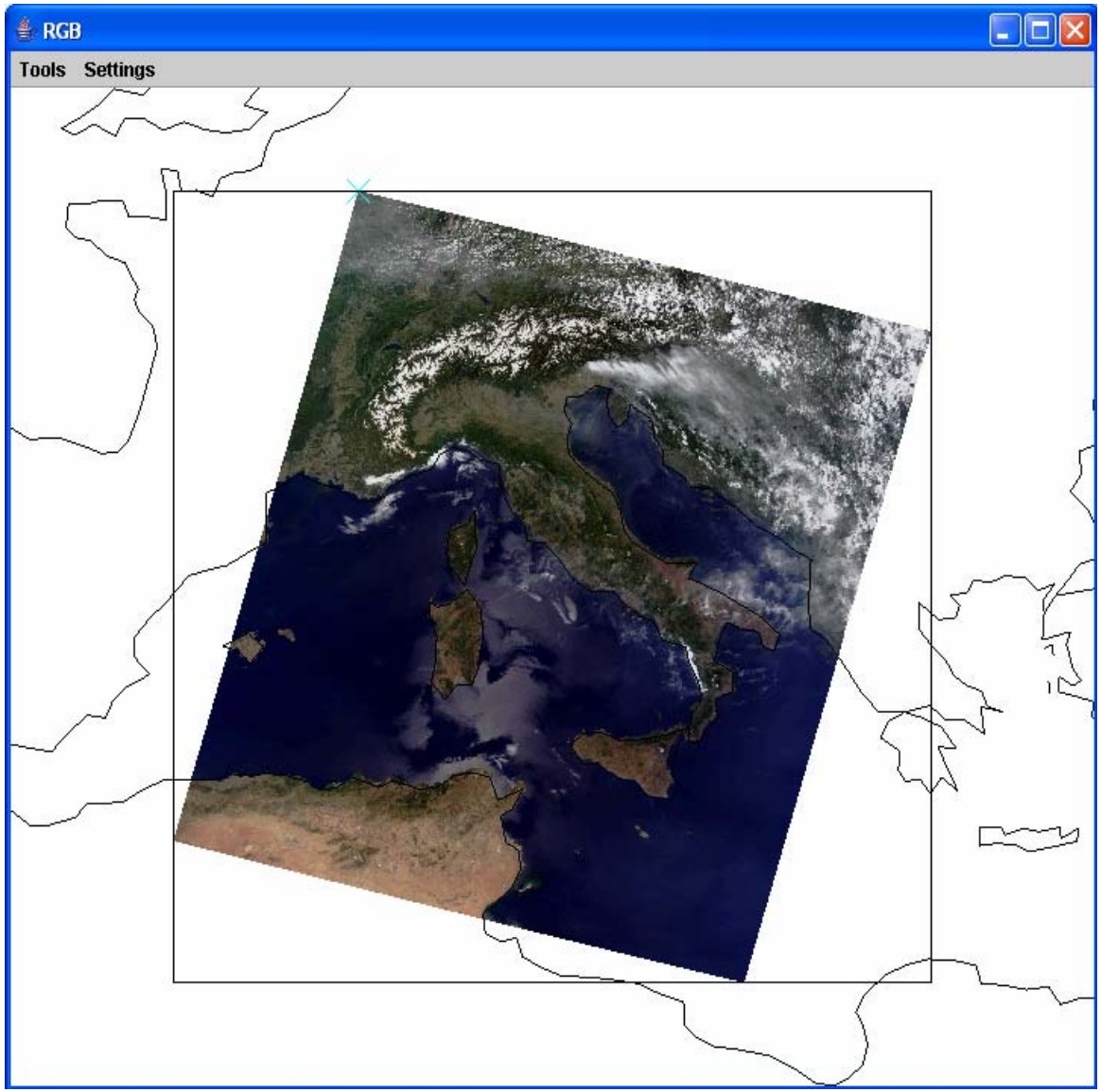
Capture Display allows you to save the image as a jpeg

Statistics displays the min and max values in the image

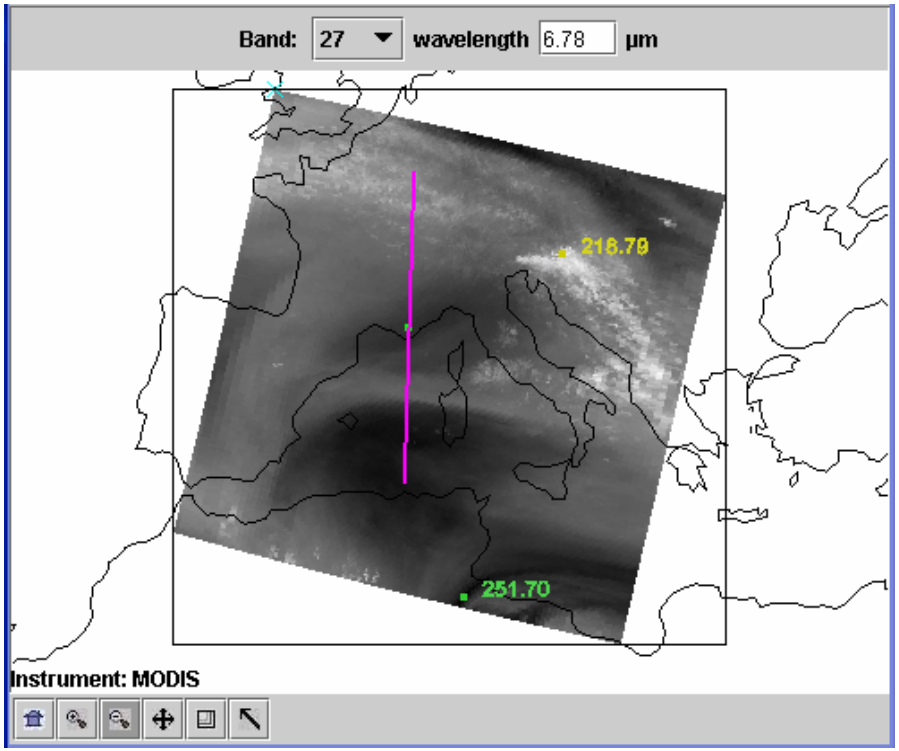
Reference Spectrum allows you to compare spectral measurements from two selected pixels (controlled by the arrows in the bottom toolbar)

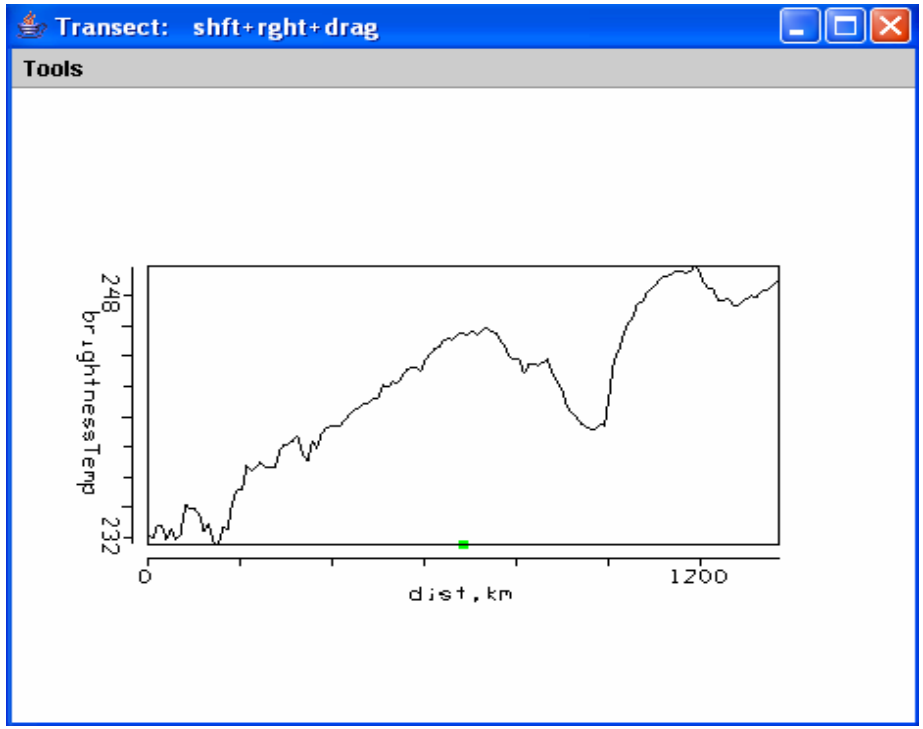
Pseudo RGB Composite Image

Red – ch 1
0.65 µm
Green – ch 4
0.55 µm
Blue – ch 3
0.47 µm

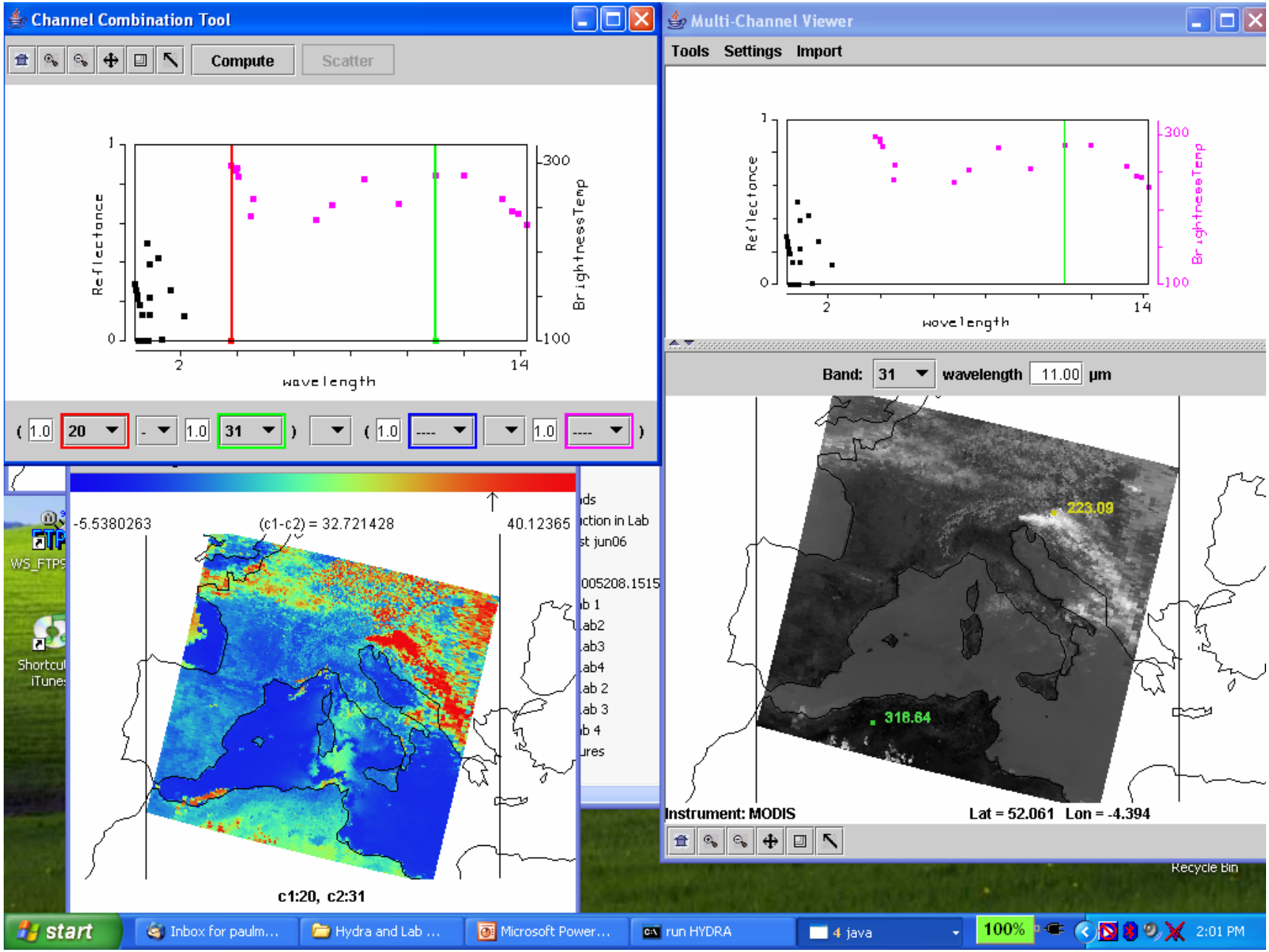


Transect

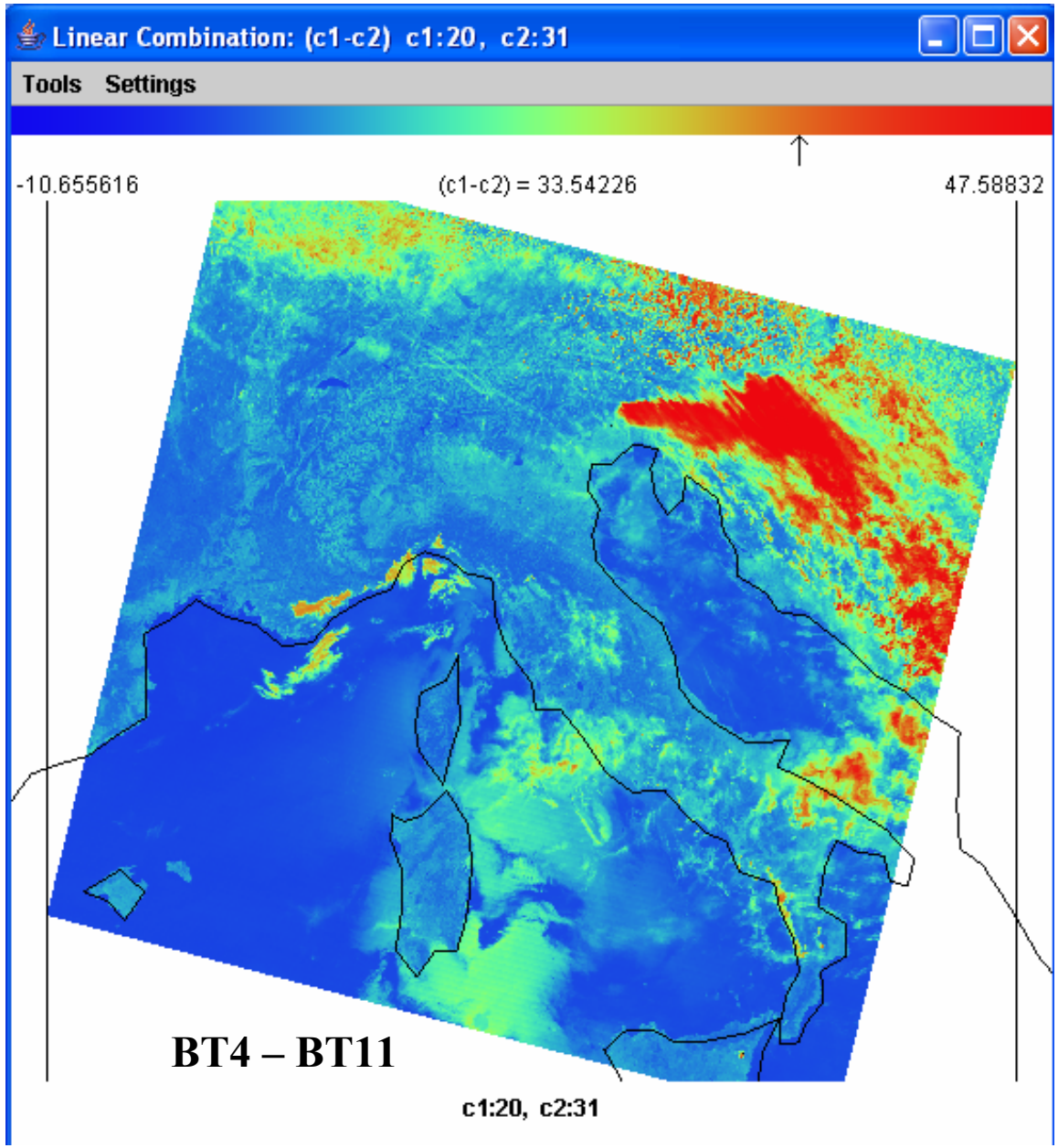

Band: 27 wavelength 6.78 µm
218.79
251.70
Instrument: MODIS


Transect: shft+rght+drag
Tools
248
brightnessTemp
232
0
1200
dist,km

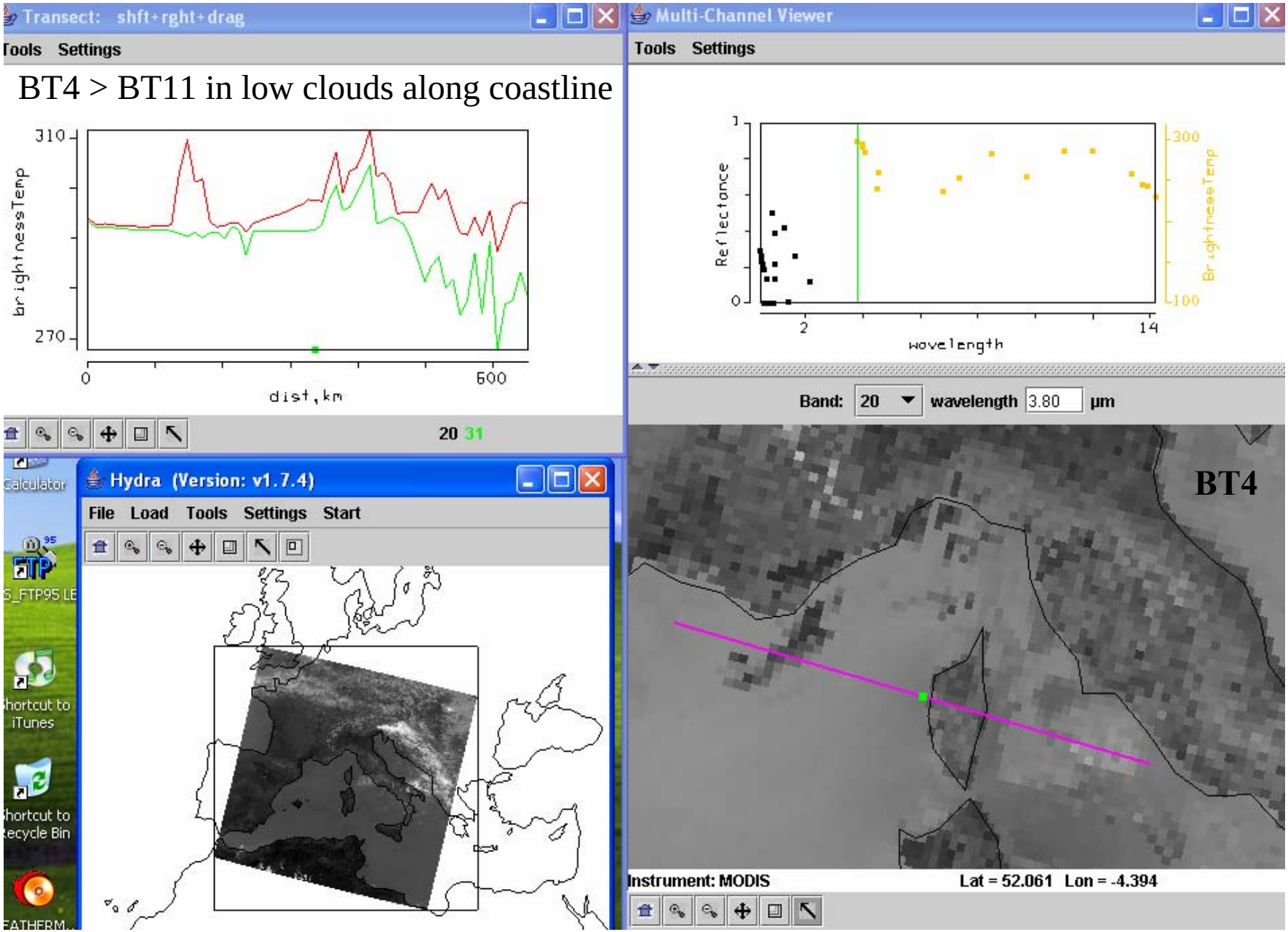
Linear Combination BT4 – BT11



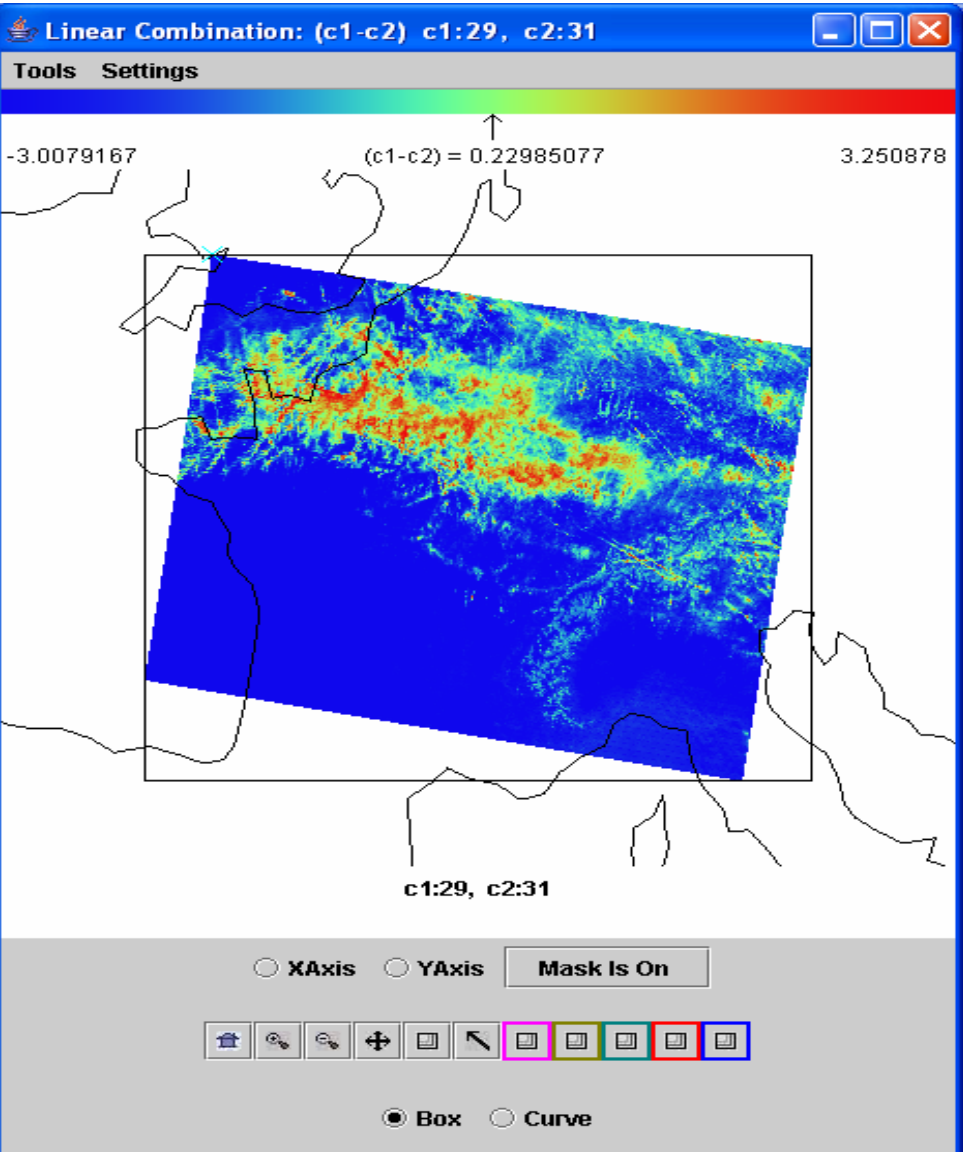
Linear Combination BT4 – BT11

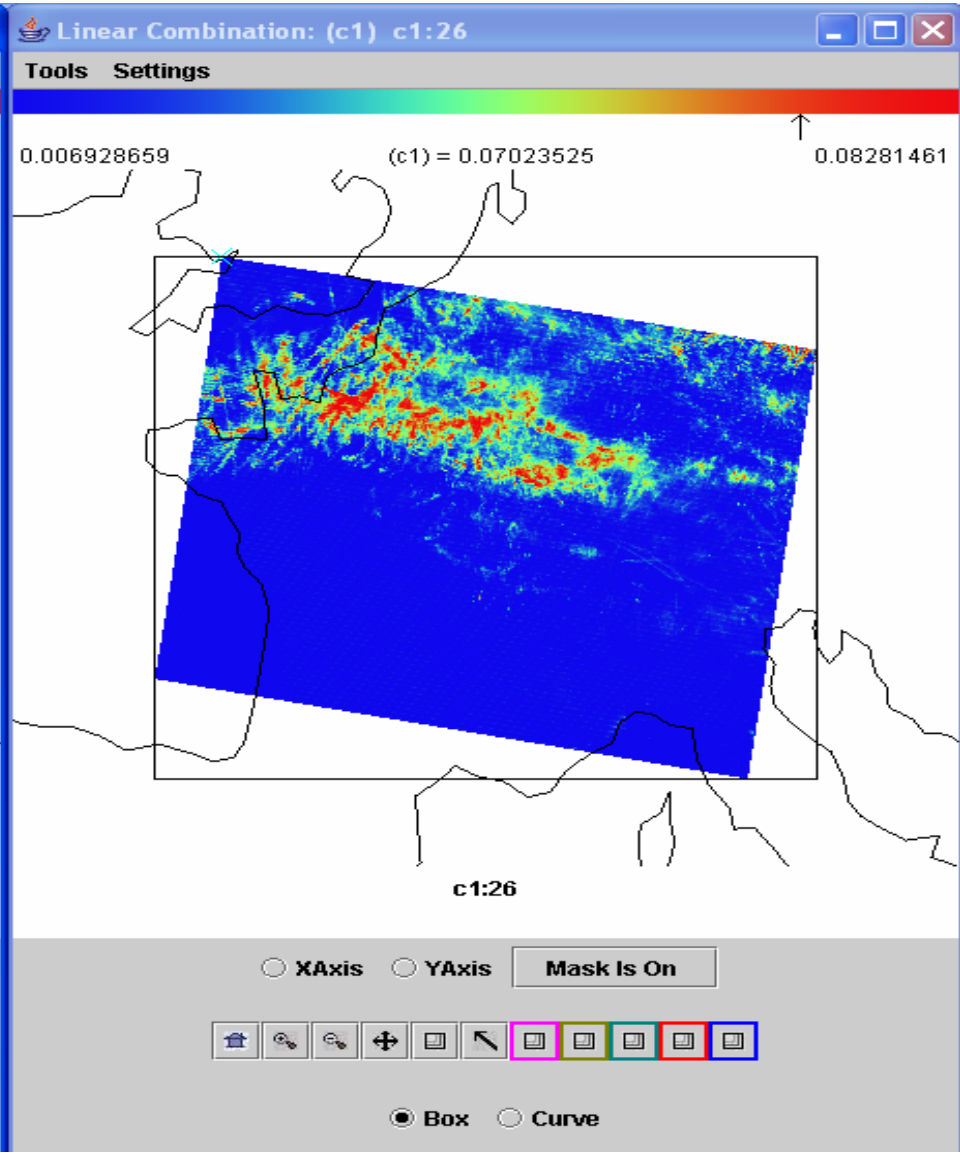


Transect


Transect: shft+rght+drag
Tools Settings
BT4 > BT11 in low clouds along coastline
310
270
brightnessTemp
0
500
dist,km
20 31
Multi-Channel Viewer
Tools Settings
Reflectance
1
0
2
14
wavelength
300
100
BrightnessTemp
Band: 20 wavelength 3.80 µm
BT4
Instrument: MODIS
Lat = 52.061 Lon = -4.394
Hydra (Version: v1.7.4)
File Load Tools Settings Start

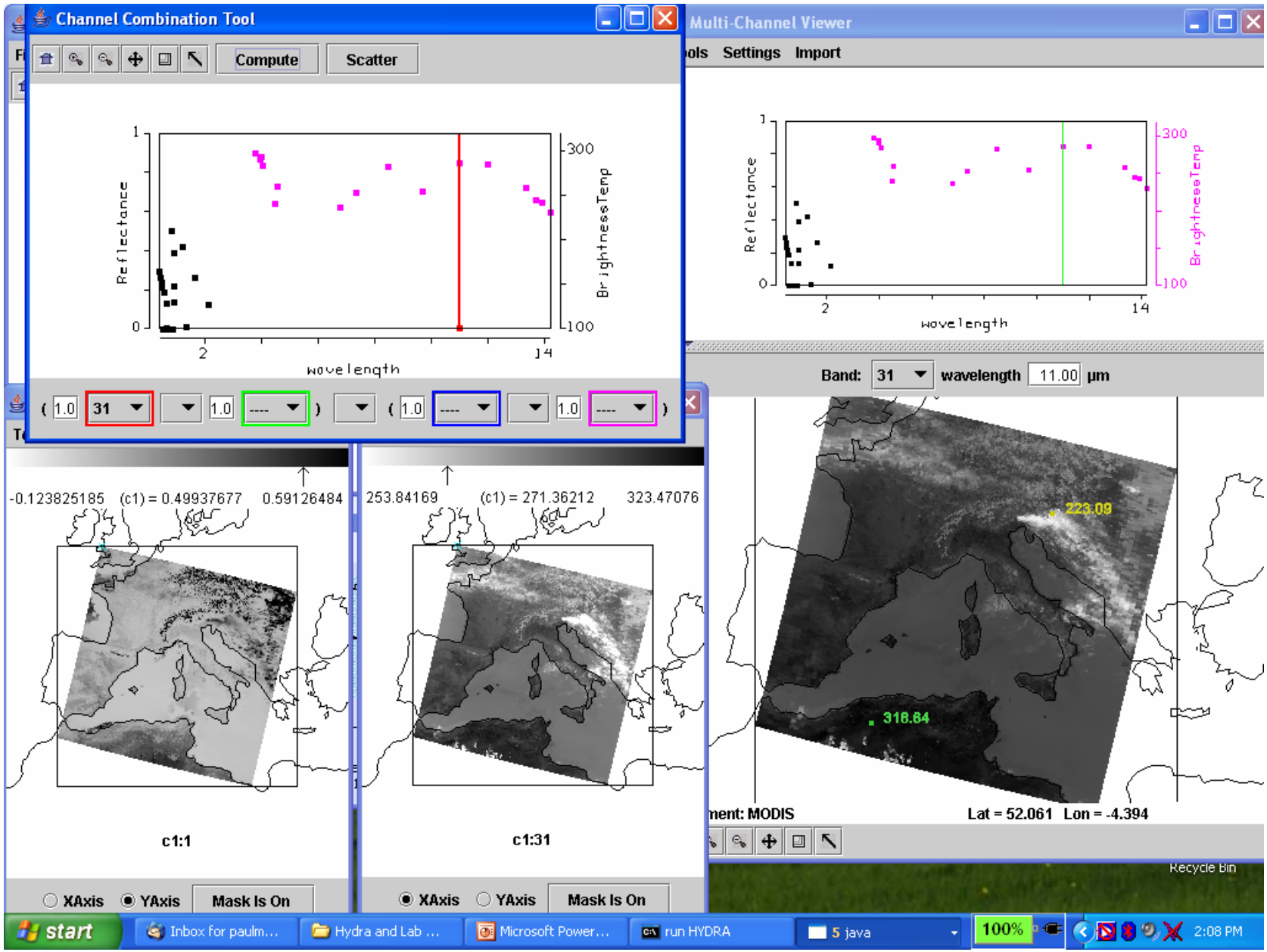
Comparing IR to NIR Cloud Detection

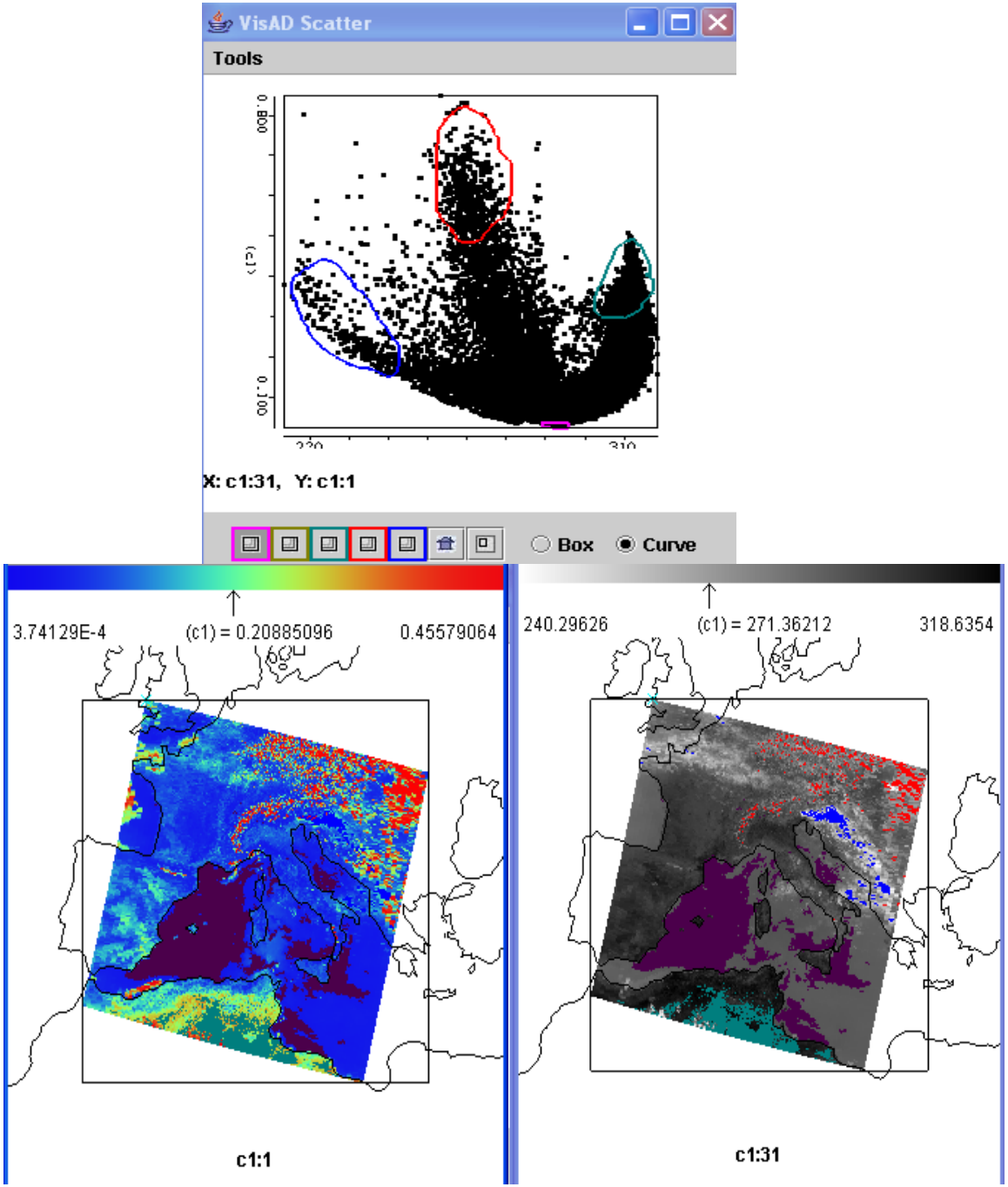




Thin cirrus show up in BT8.6-BT11 (left) as well as r1.38 (right)

Setting up for scatter plot of BT11 vs r0.66

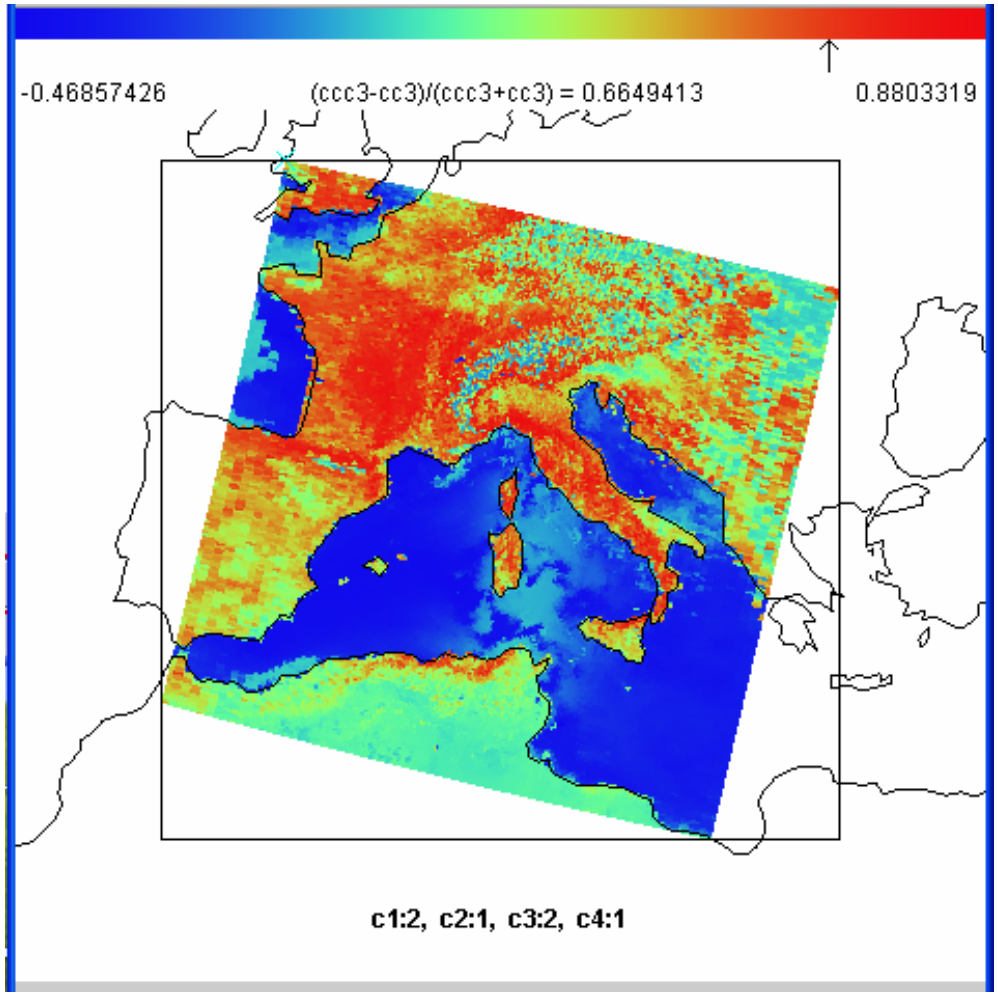




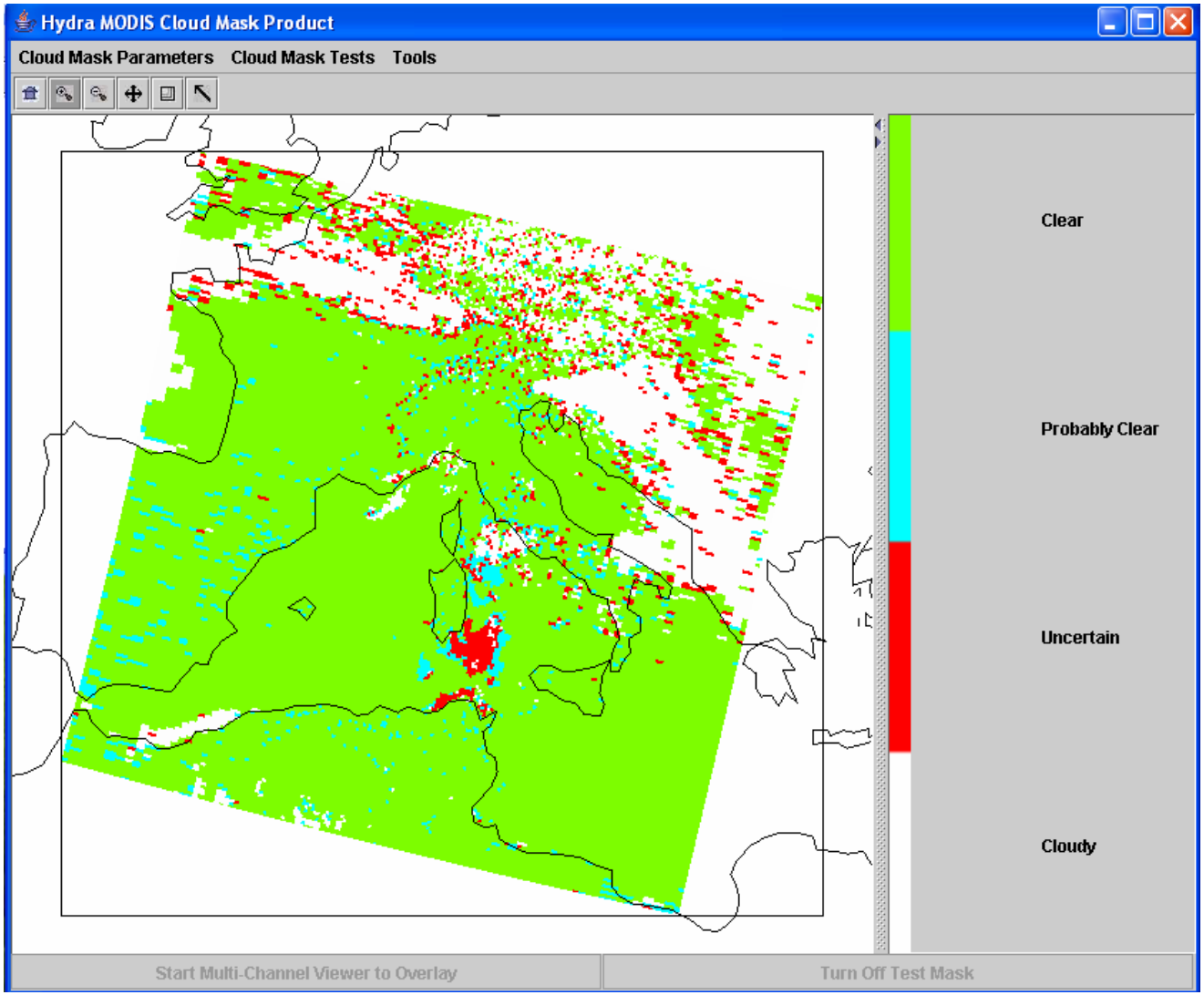
Scatter Plot of r_{vis} vs BT_{11}

with colors highlighting locations of pixels in plot on images

Linear Combinations Pseudo Image of Normalized Vegetation Index $[(r_2 - r_1)/(r_2 + r_1)]$

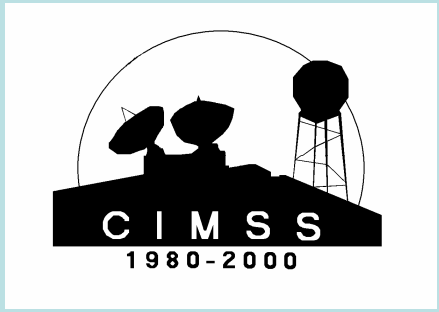


MODIS level 2 cloud mask display



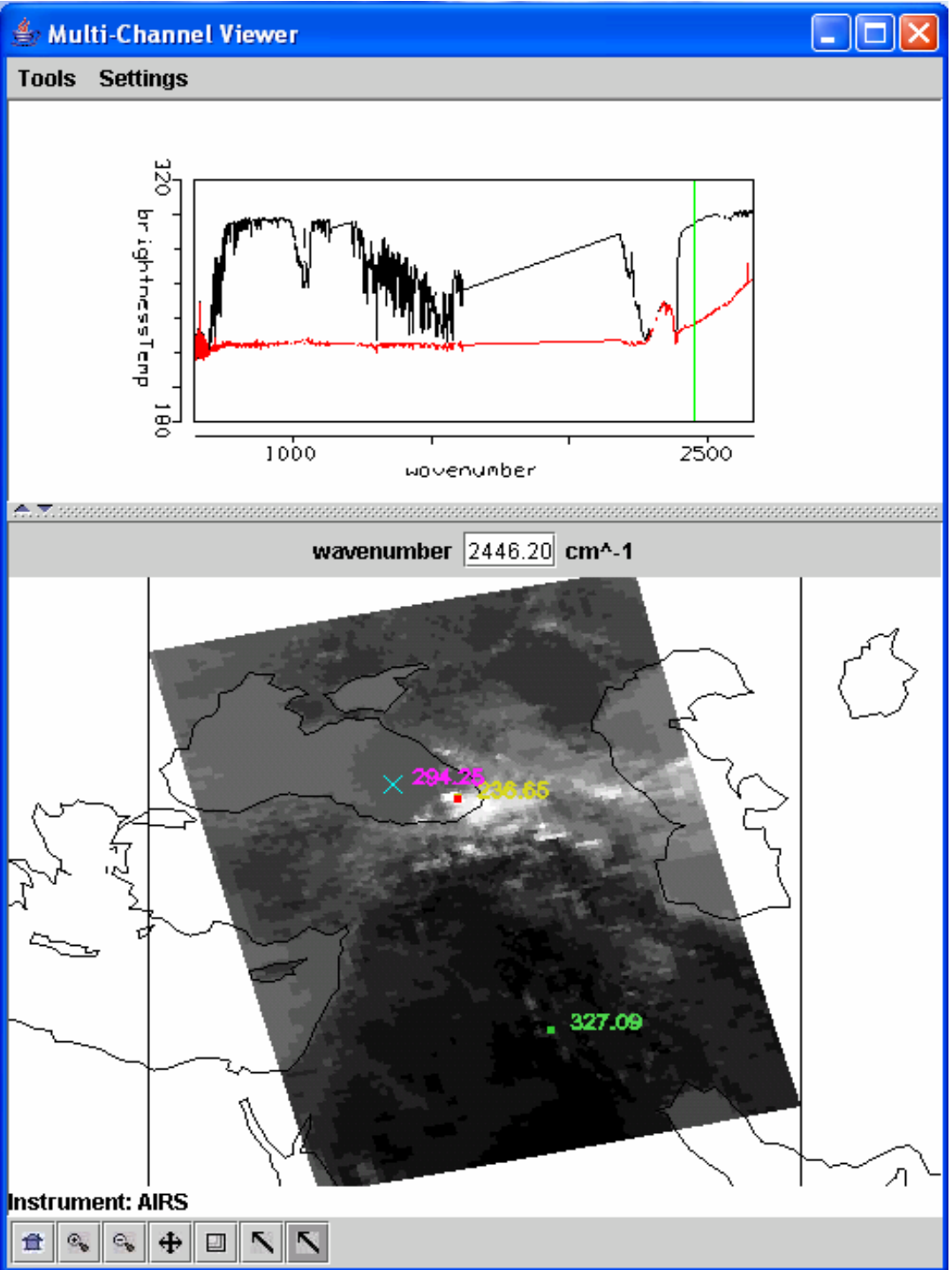
clear =green
probably clear (95% certain) = turquoise
uncertain = red
cloudy = white

Interrogating MODIS & AIRS data using HYDRA



Paul Menzel
NOAA Satellite and Information Services

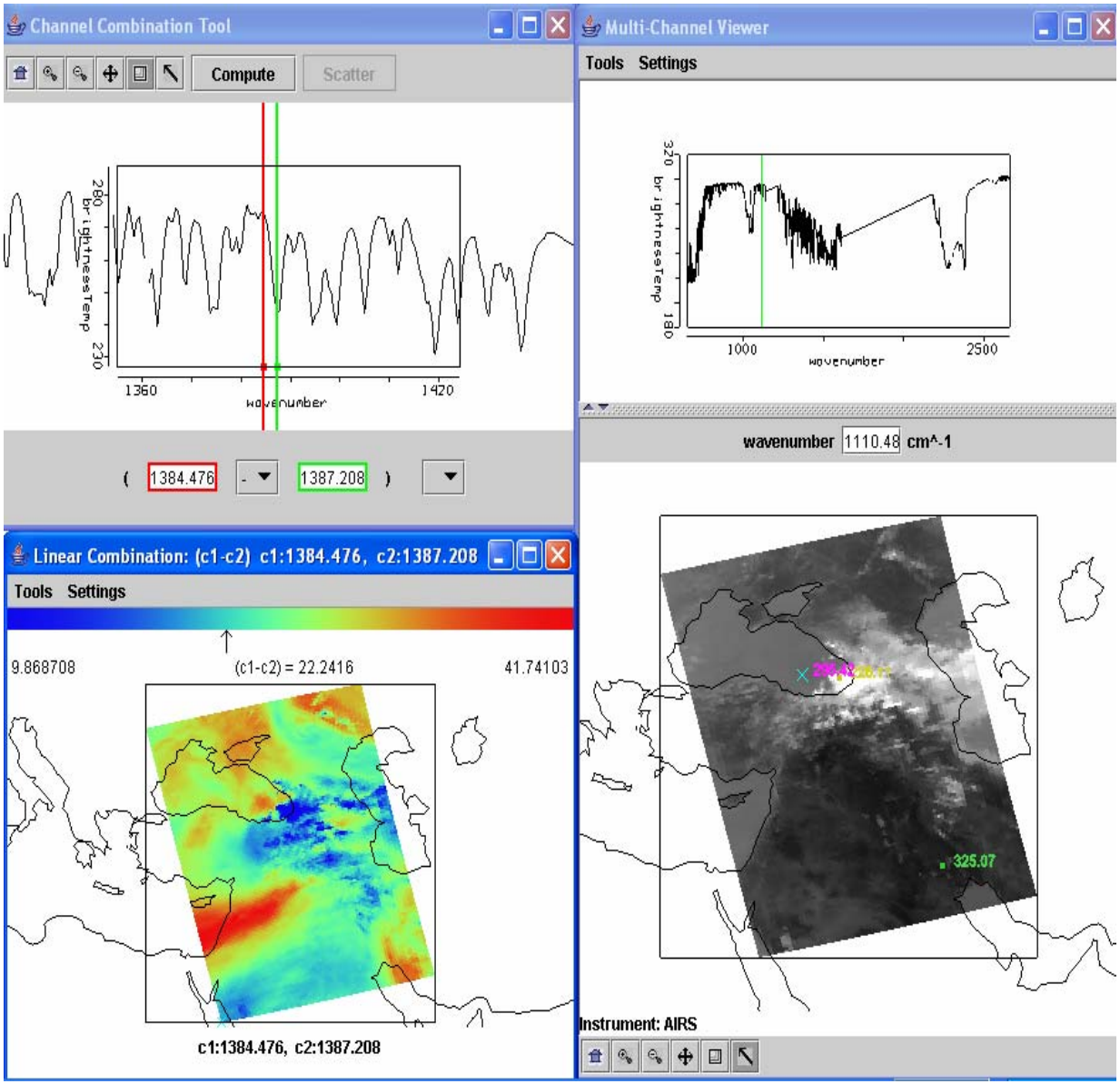
What is HYDRA?
What can it do?
Some examples with AIRS
How to get it?



AIRS data

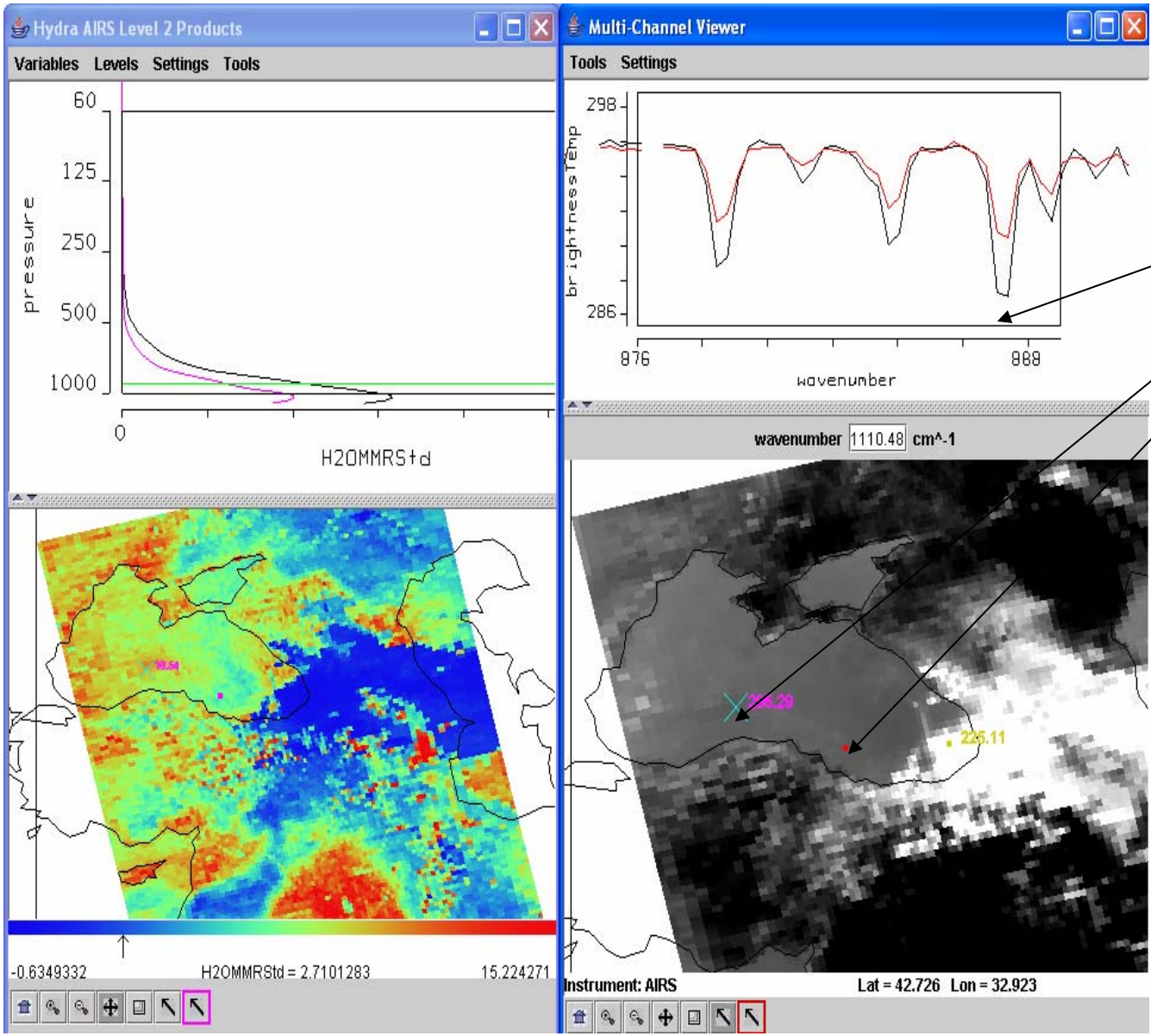
over
Black & Caspian Seas
28 August 2005

BT1384.5 minus BT1387.2



BT differences of more than 40 K are seen in clear regions and less than 1 K in opaque high cloudy regions

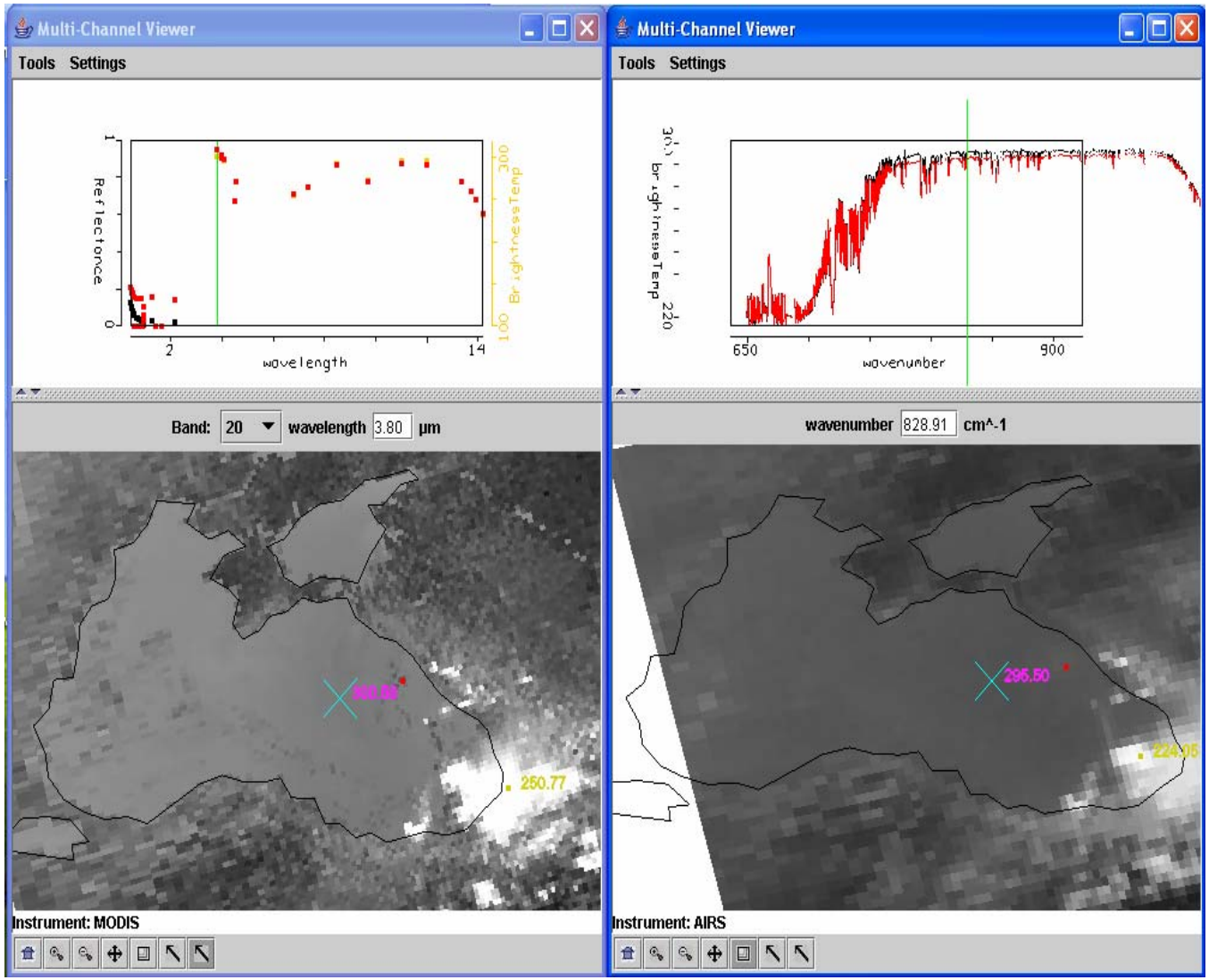
Investigating AIRS Retrievals



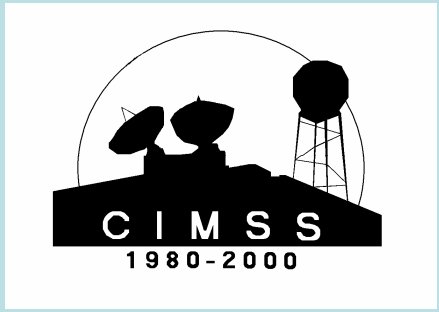
On-line off-line BT difference is greater in western (blue x) than eastern (red dot) location of Black Sea; x has more low level moisture than dot.

This is confirmed by moisture profiles (upper left); 900 hPa retrieved moisture image (lower left) shows moisture gradients

AIRS (right) and MODIS (left) co-located display of spectra



Interrogating MODIS & AIRS data using HYDRA



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NOAA Satellite and Information Services

What is HYDRA?
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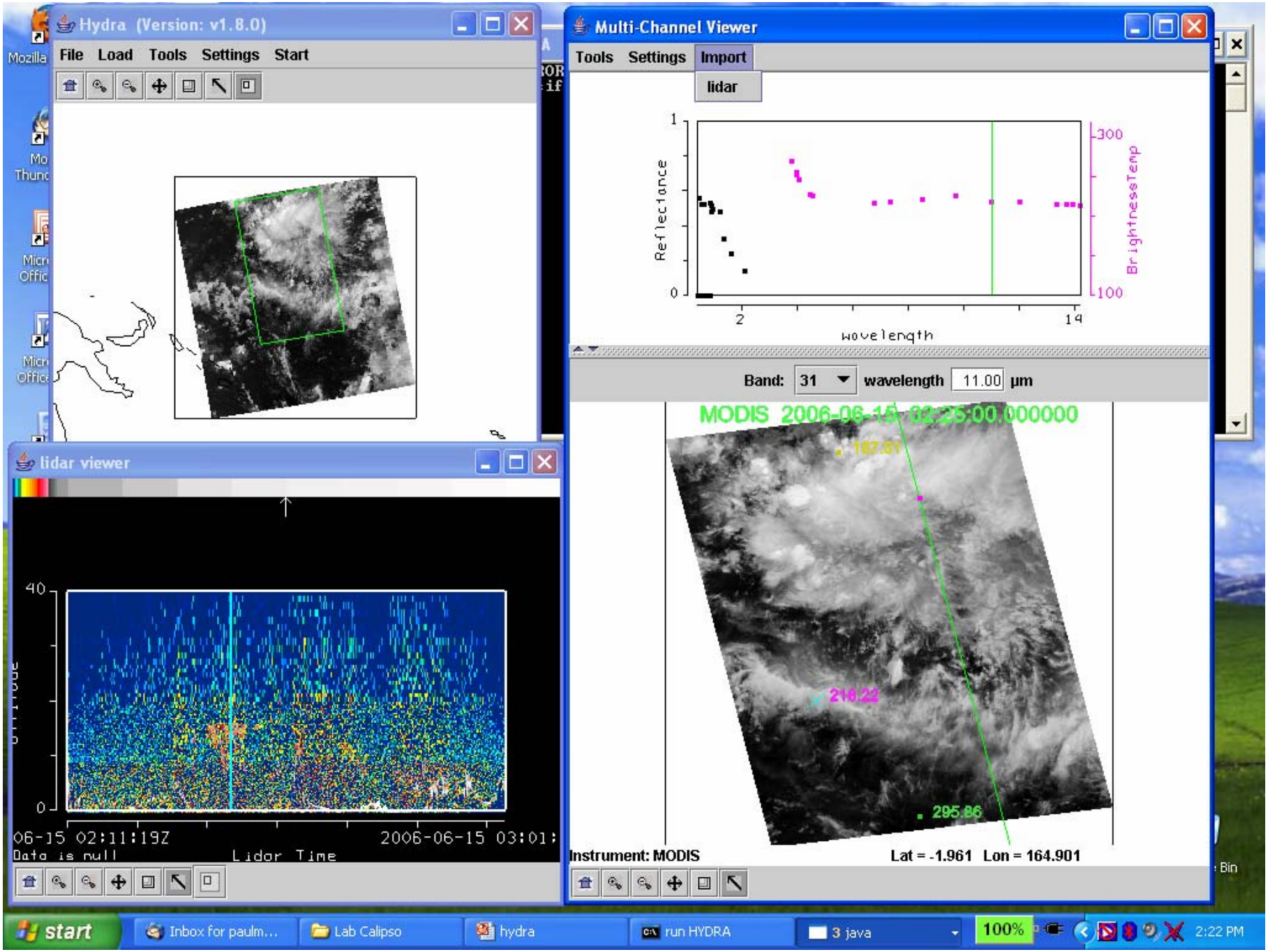
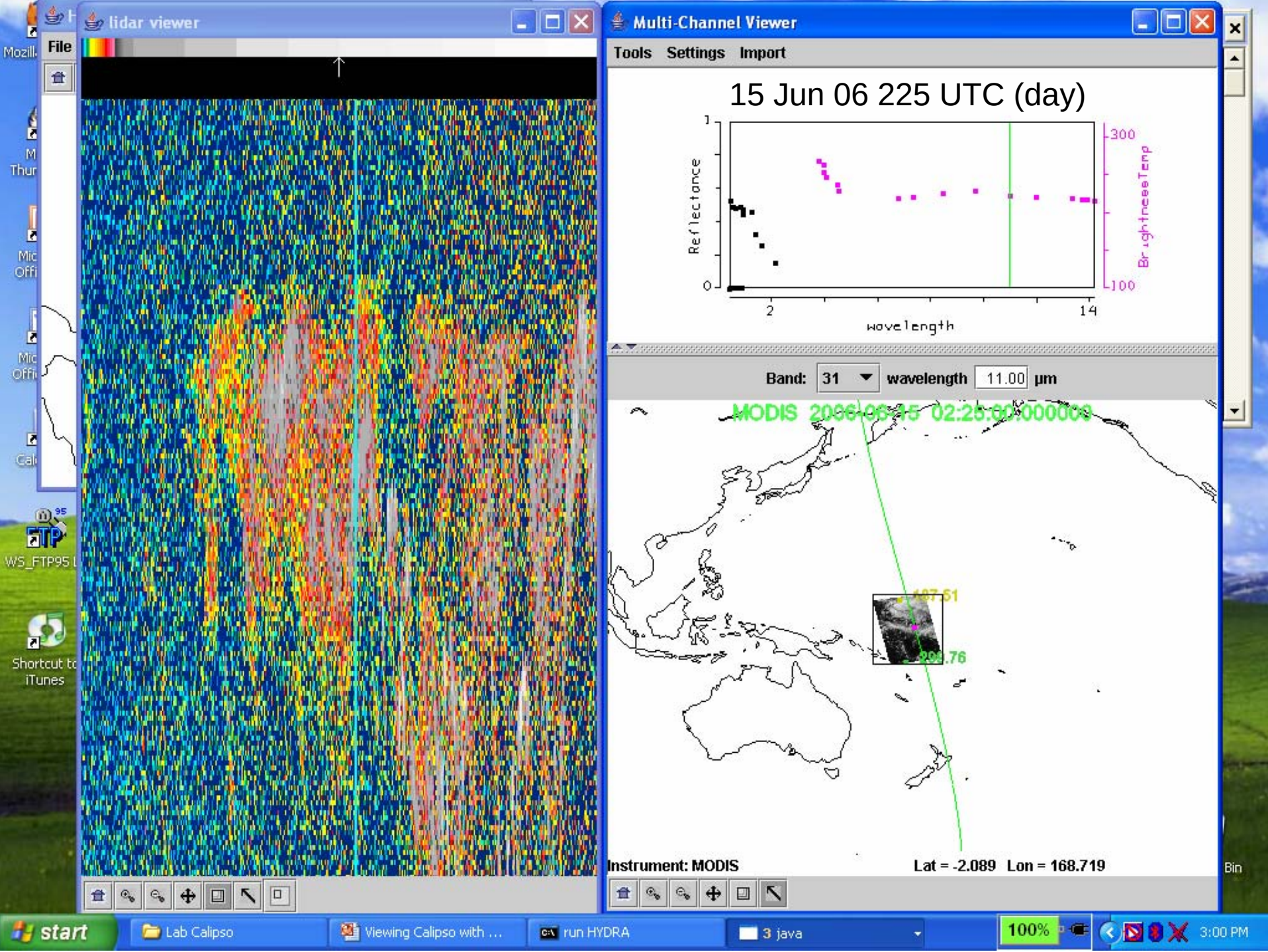
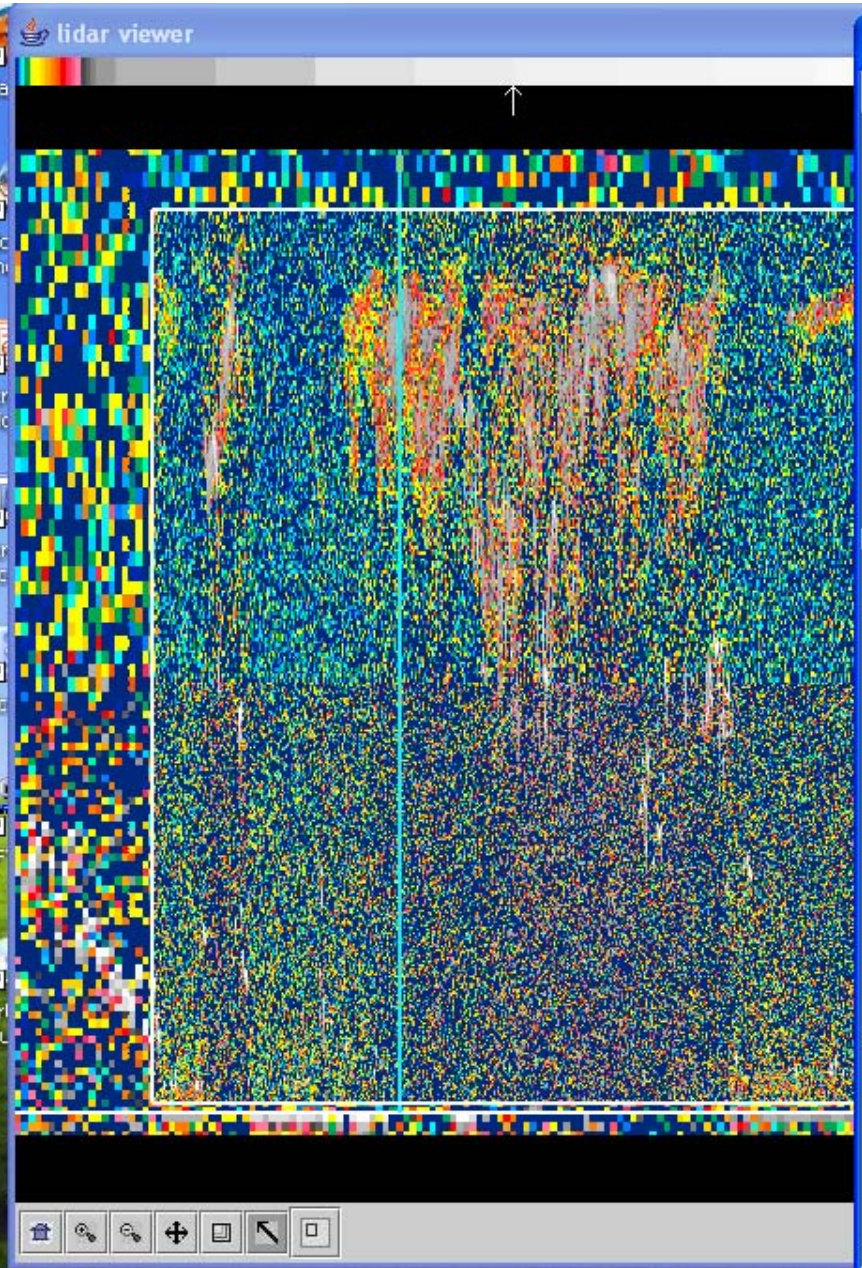
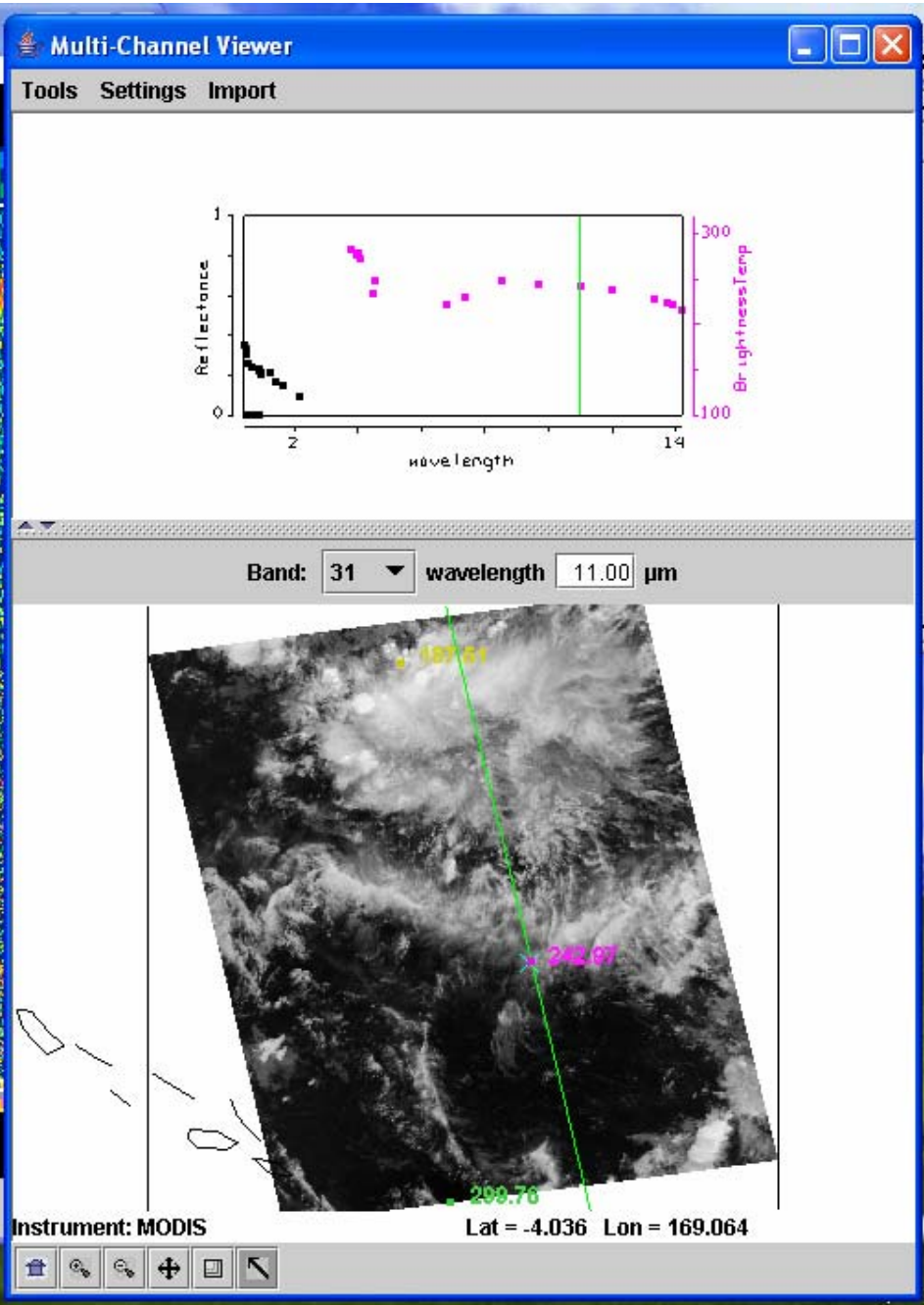
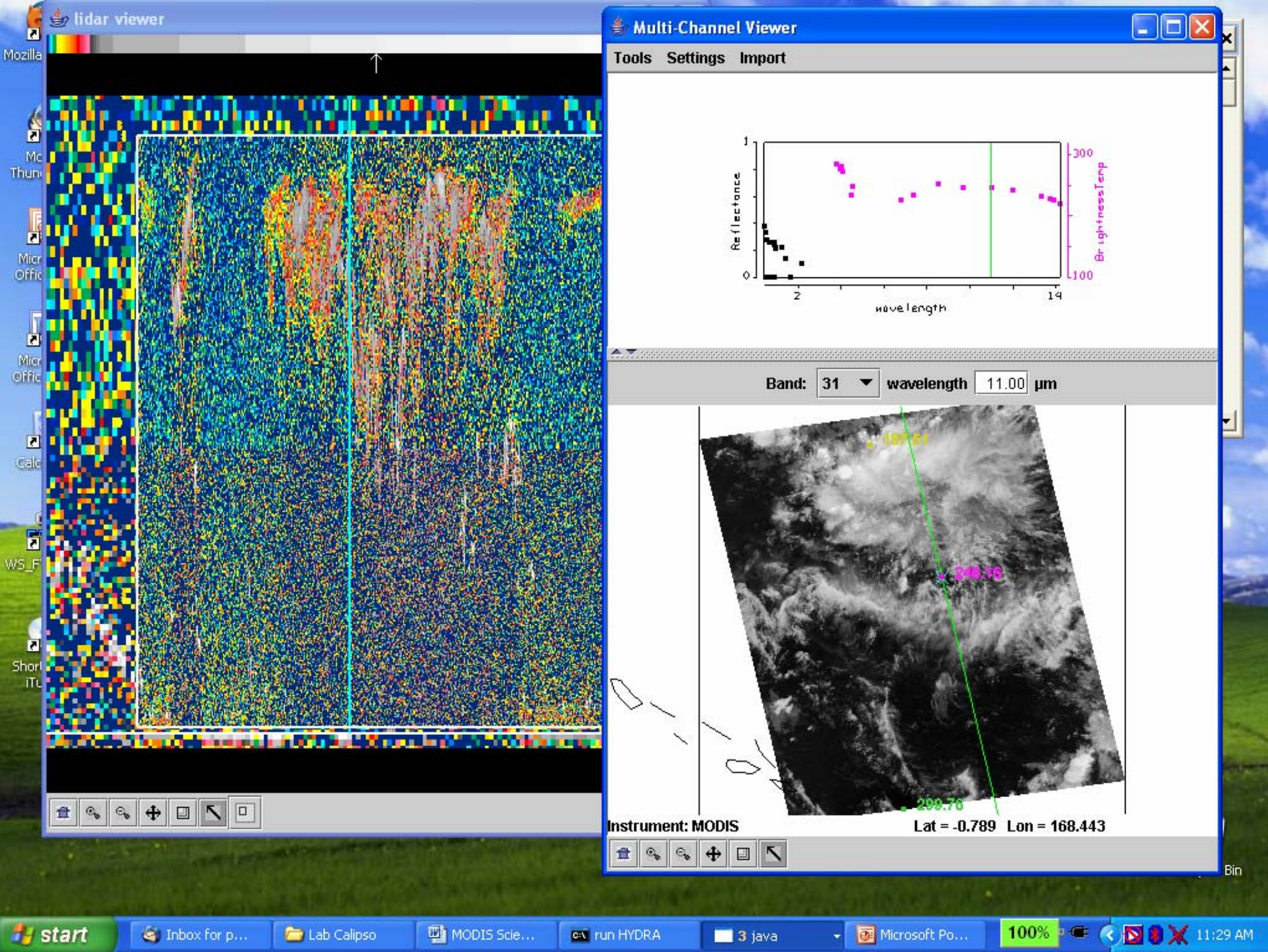
Some examples with CALIPSO
How to get it?

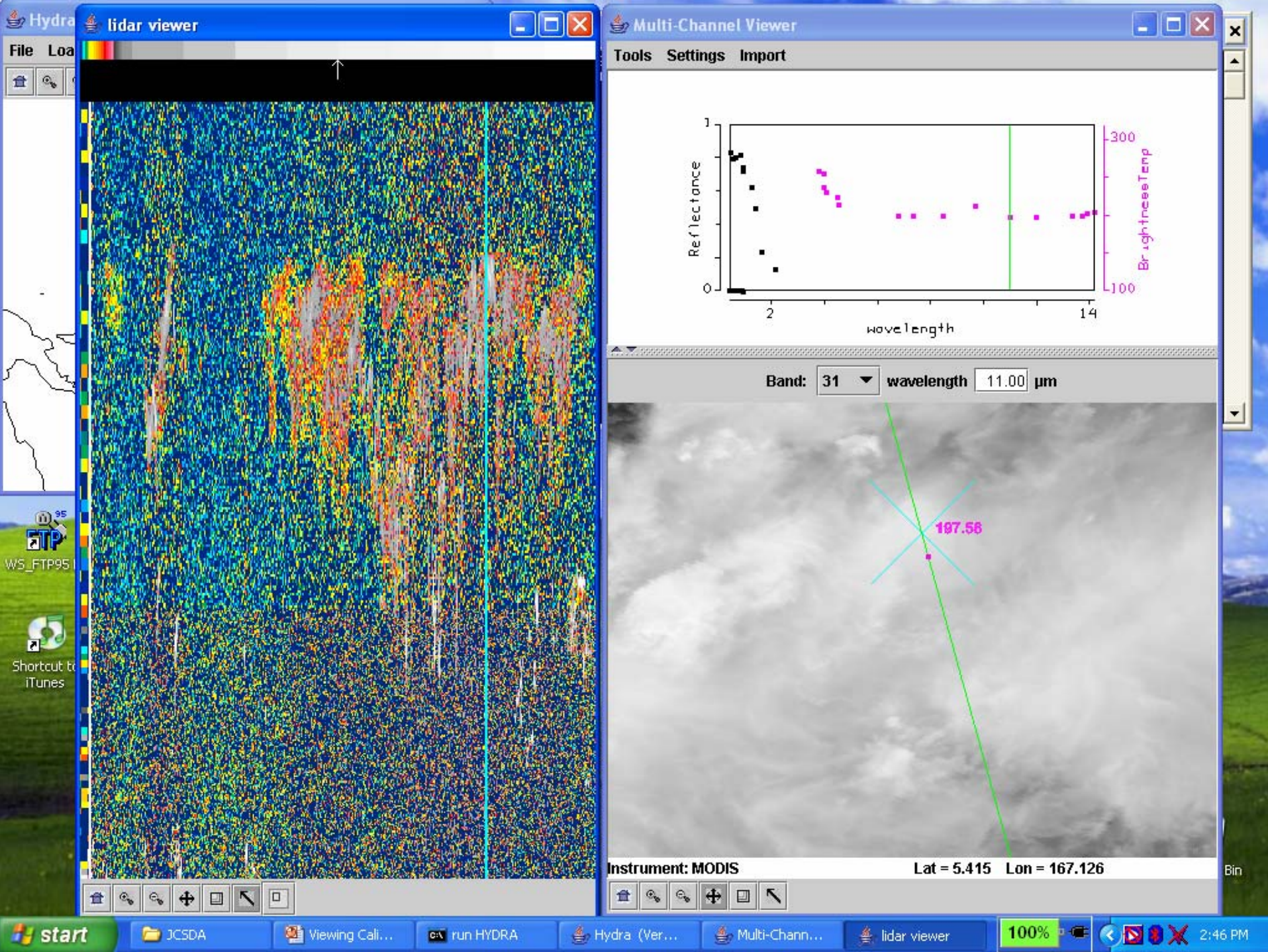

Hydra (Version: v1.8.0)
File Load Tools Settings Start
Multi-Channel Viewer
Tools Settings Import
lidar
Reflectance
BrightnessTemp
Wavelength
Band: 31 wavelength 11.00 µm
MODIS 2006-06-15 02:25:00.000000
218.22
295.86
Instrument: MODIS
Lat = -1.961 Lon = 164.901
lidar viewer
Data is null
Lidar Time
start
Inbox for paulm...
Lab Calipso
hydra
run HYDRA
3 java
100%
2:22 PM

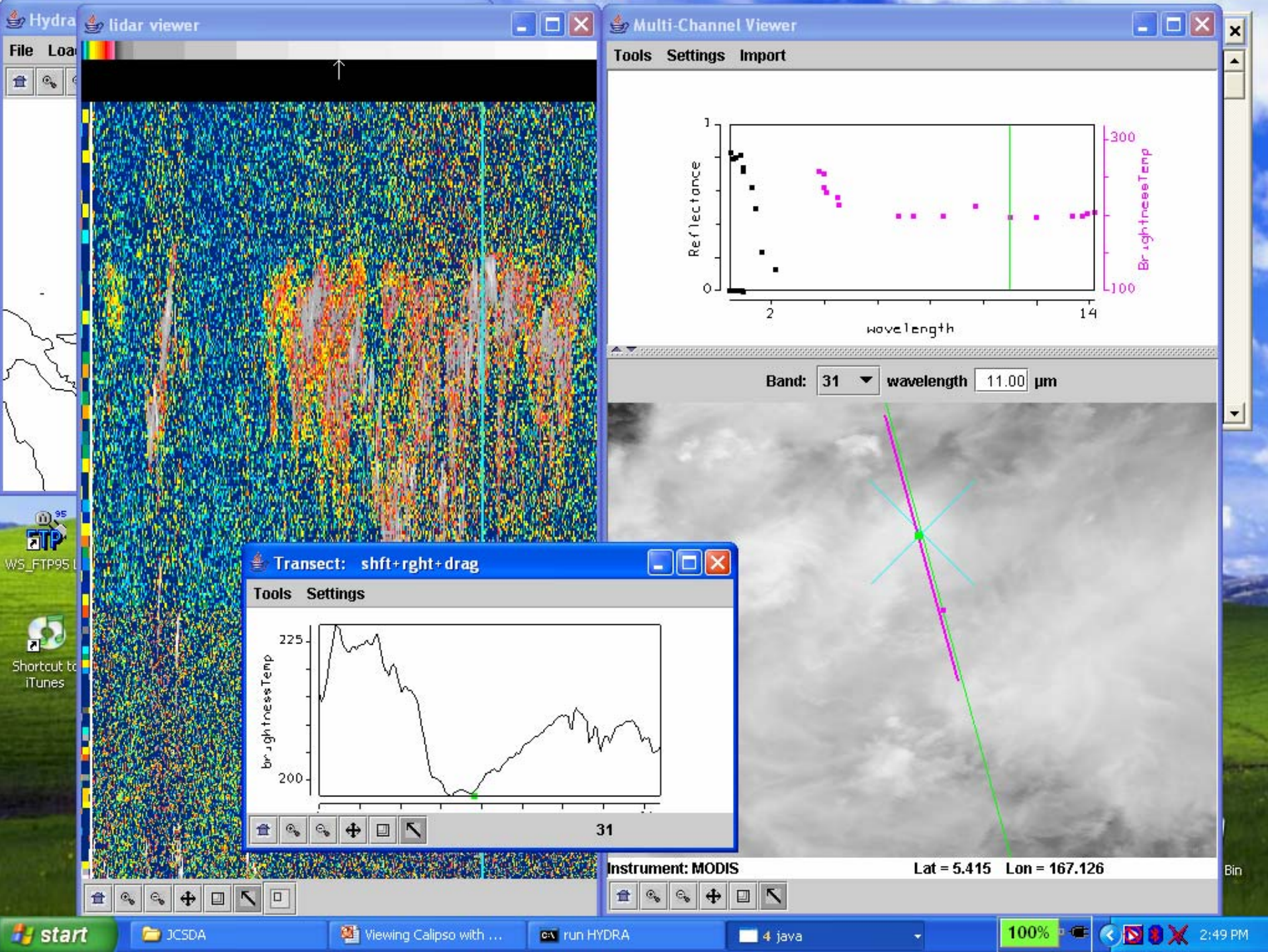

lidar viewer
File
Multi-Channel Viewer
Tools
Settings
Import
15 Jun 06 225 UTC (day)
Reflectance
BrightneseTemp
wavelength
Band:
31
wavelength
11.00
μm
MODIS
Instrument: MODIS
Lat = -2.089
Lon = 168.719
start
Lab Calipso
Viewing Calipso with ...
run HYDRA
3 java
100%
3:00 PM

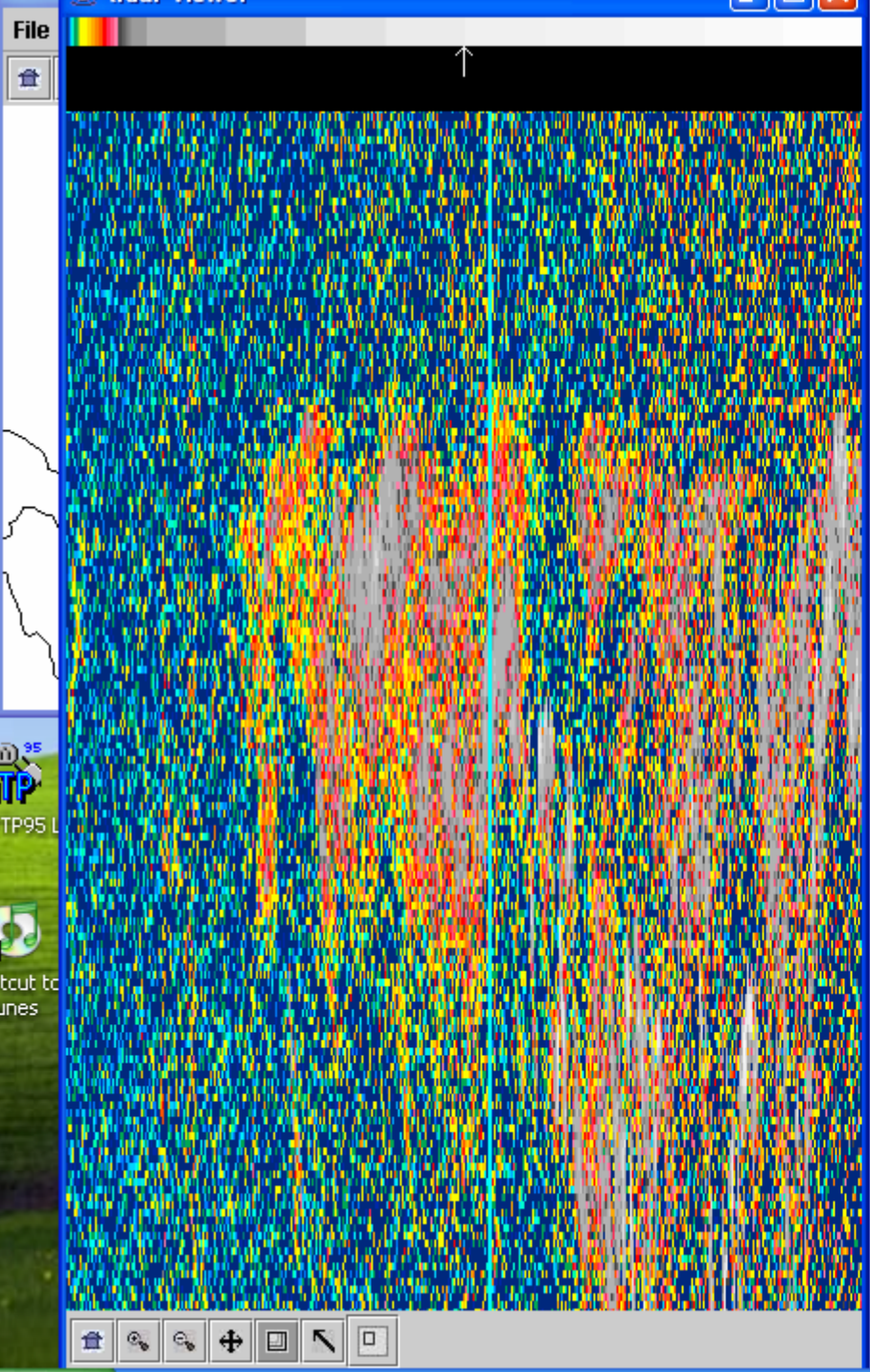

lidar viewer

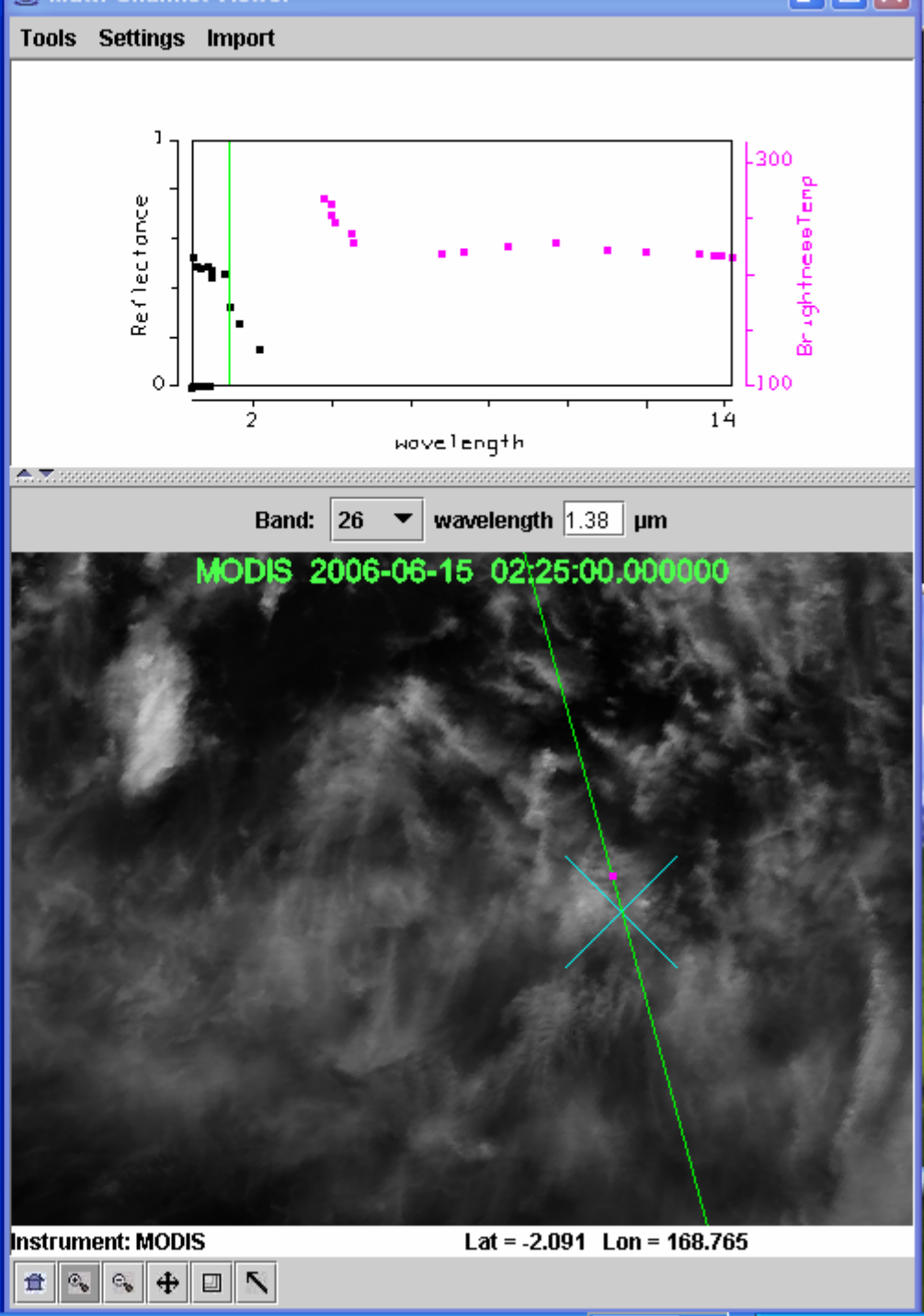

Multi-Channel Viewer
Tools
Settings
Import
Reflectance
BrightnessTemp
wavelength
Band: 31
wavelength 11.00 µm
Instrument: MODIS
Lat = -4.036 Lon = 169.064


lidar viewer
Multi-Channel Viewer
Tools
Settings
Import
Reflectance
BrightnessTemp
wavelength
Band:
31
wavelength
11.00
μm
Instrument: MODIS
Lat = -0.789
Lon = 168.443
start
Inbox for p...
Lab Calipso
MODIS Scie...
run HYDRA
3 java
Microsoft Po...
100%
11:29 AM

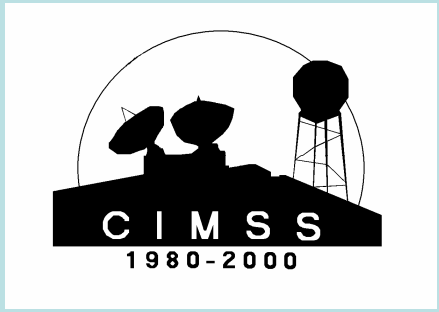

lidar viewer
Multi-Channel Viewer
Tools
Settings
Import
Reflectance
BrightnessTemp
wavelength
Band:
31
wavelength
11.00
µm
197.56
Instrument: MODIS
Lat = 5.415
Lon = 167.126
start
JCSDA
Viewing Cali...
run HYDRA
Hydra (Ver...
Multi-Chann...
lidar viewer
100%
2:46 PM


Hydra
File Loa
lidar viewer
Multi-Channel Viewer
Tools Settings Import
Reflectance
1
0
2
14
wavelength
300
100
BrightnessTemp
Band: 31 wavelength 11.00 µm
Transect: shft+rght+drag
Tools Settings
225
200
brightnessTemp
31
Instrument: MODIS
Lat = 5.415 Lon = 167.126
WS_FTP95 L
Shortcut to
iTunes
Bin
start
JCSDA
Viewing Calipso with ...
run HYDRA
4 java
100%
2:49 PM




Tools
Settings
Import
Reflectance
wavelength
BrightneeeTemp
1
0
2
14
300
100
Band:
26
wavelength
1.38
μm
MODIS 2006-06-15 02:25:00.000000
Instrument: MODIS
Lat = -2.091 Lon = 168.765

Interrogating MODIS & AIRS data using HYDRA



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What is HYDRA?
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- The HYDRA Team
- Tutorial on HYDRA (AIRS data)
- Links to OpenDAP MODIS & AIRS servers
- Download HYDRA
- Notes on using OpenADDE for local GOES & MSG files

HYperspectral-viewer for Development of Research Applications

If you would like to send comments and be notified of updates, please join the HYDRA email list, by sending a note to: **hydra-subscribe@ssec.wisc.edu**. You will receive a confirmation email that you will also need to respond to in order to verify your email address.

Updated 3 March 2005

Downloading and Installing HYDRA

For Windows Users

Important note: before installing this version, be sure to uninstall the previous one! using: `Start->Control Panel->Add/Remove Programs`.

Download the installer file from this location to a temporary directory. When the transfer is complete, just *run* this file and follow the instructions. We recommend just using the default options presented.

For Linux Users

Download the tar-gz file from this location. When the transer is complete, then 'cd' to the parent directory and unpack the archive. This will **create** its own *hydra* subdirectory as a child.

For Mac OS-X Users

Download the tar-gz file from this location. When the transer is complete, then 'cd' to the parent directory and unpack the archive. This will **create** its own *hydra* subdirectory as a child. You must have Java and Java3D installed in order to use HYDRA.

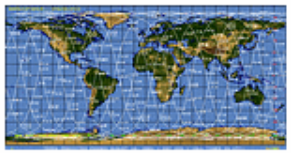
Running the HYDRA application

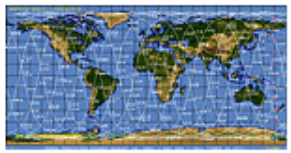
To startup the Hydra application, either click on the menu item (Windows) or type the command *runhydra.bat*. On Linux, you will likely just type in the command *runhydra*. Please see the on-line tutorial for more details.

Near-Real-Time Level-2 Browse

Date: 2005/102 - 04/12/05

prev next


Terra Orbit Tracks


Aqua Orbit Tracks


Display true-color and false-color


Access other dates from the archive

Terra/MODIS

00:00 UTC	03:15 UTC	06:20 UTC	09:45 UTC	12:55 UTC	16:05 UTC	19:40 UTC
						
4km	4km	4km	4km	4km	4km	4km
2km	2km	2km	2km	2km	2km	2km
1km	1km	1km	1km	1km	1km	1km
500m	500m	500m	500m	500m	500m	500m
250m	250m	250m	250m	250m	250m	250m

Goddard Earth Sciences (GES) Data and Information Services Center (DISC) - Microsoft Internet Explorer

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Address http://daac.gsfc.nasa.gov/ Go Links

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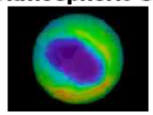
WHAT'S HOT

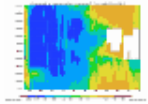
Mirador: A new and fast search and order interface
Mirador is a drastically simplified, clean interface employing Google technology for metadata keyword searches. Other features include quick response, data file hit estimator, Gazetteer, and an interactive shopping cart.
+ Start using Mirador
+ Learn more about Mirador

Atmospheric Composition DISC



This is a virtual data portal that provides convenient access to all Atmospheric Composition (AC) data sets.
+ Visit the ACDISC

Giovanni tool helps scientists analyze data online



Giovanni is a powerful online analysis tool that is helping scientists better understand Earth science data without downloading data.
+ Learn More about Giovanni

S4PM released under NASA's open source license
The Simple, Scalable, Script-based Data Science Processor for Measurements (S4PM) supports industrial strength processing.
+ Learn More about S4PM

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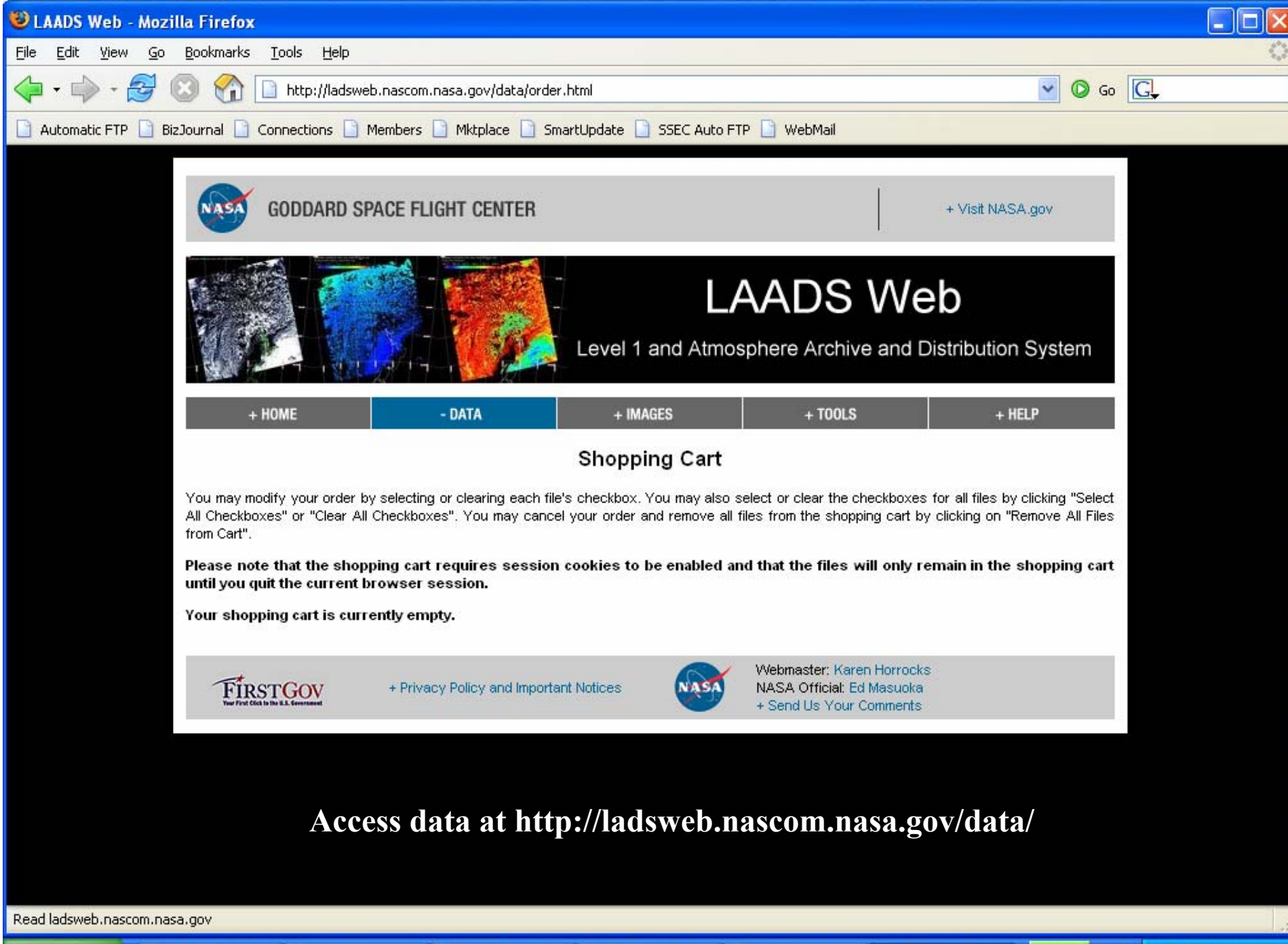
http://daac.gsfc.nasa.gov/get_data.shtml Internet

start | Search Results | 2 Microsoft Office P... | VZAccess Manager | Goddard Earth Scienc... | 100% | 11:06 AM



Access data at http://ladsweb.nascom.nasa.gov/data/

For hydra
http://www.ssec.wisc.edu/hydra/

For data and quick browse images
http://rapidfire.sci.gsfc.nasa/realtime

For MODIS and AIRS data orders
http://daac.gsfc.nasa.gov/

After mid Aug 2006 go to

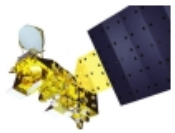
https://ladsweb.nascom.nasa.gov/data

Steps in downloading data

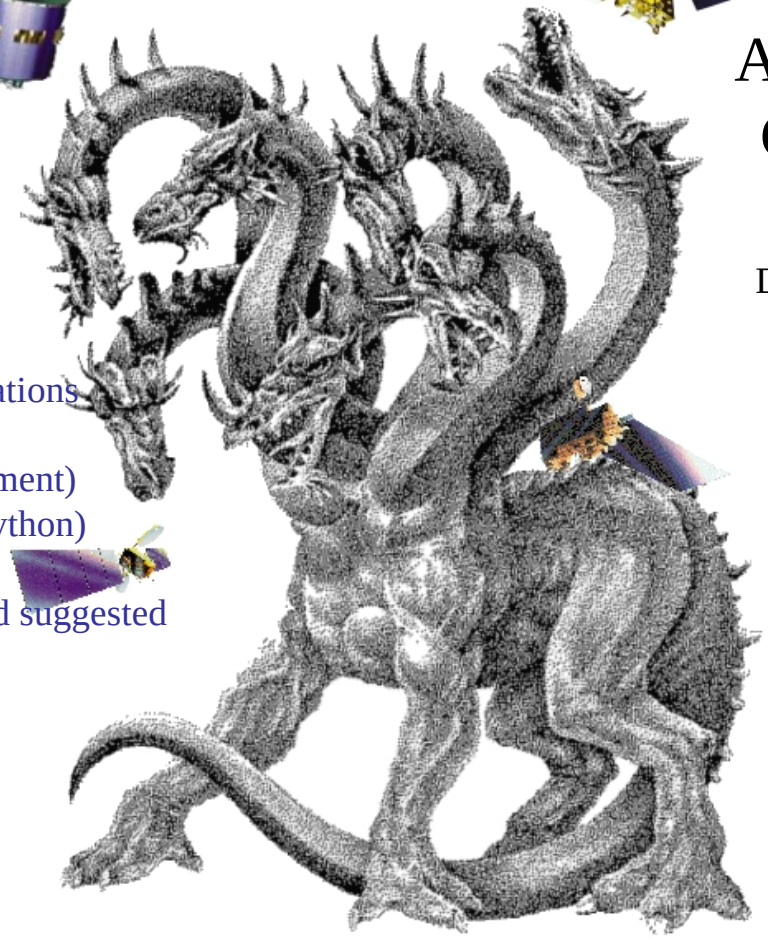
- 1) Go to http://ladsweb.nascom.nasa.gov/
- and select data and then search. Make sure that cookies are accepted by your browser (most browsers are set this way already). Under Satelllite/Instrument choose either Aqua or Terra
- 2) Under Group: Choose Aqua Level 1 Products or Terra Level 1 Products (depends on what you chose in step 1).
- 3) Under Products: Choose either 1km, 500m or 250m L1B Calibrated Radiances or you can choose all 3 if you want.
- 4) Under Start Date and Time: Use 07/10/2006 00:00:00
- 5) Under End Date and Time: 07/15/2006 23:59:59
- 6) In the Spatial Selection section choose: Latitude/Longitude
- A map should pop up. You can either outline your area of interest buy outlining a box on the map, or you can type in the North, South, East and West Limits in the boxes to the right of the images for your area of interest (Sudan). I used 0 South, 20 North, 25 West and 35 East.
- 7) Under Coverage Selection Choose:If you only want Day granules (will contain channels in the visible wavelengths) , then make sure the Night and Both boxes are not checked. I chose to only get Day granules.
- 8) Click on the Search button at the bottom. This might take a minute or two.
- 9) Eventually, I received a page that contained 6 pages of granules that met my search criteria. Under the Browse column, I could click on the image to get a quick look view of the granule.
- 10) I chose to order all of the granules that were returned from my search. I clicked on the Order Files Now button at the bottom of the window.
- 11) A page appeared that asked for my email address. I typed it in: kathy.strabala@ssec.wisc.edu
  12) I chose FTP Pull and clicked on the Order button.
- 13) It returned a window that told me some of my order is ready (alot of the data is already online). The rest of the data will be staged and I will be informed via email when it is ready.
- 14) I received an email that tells me how I can get the data.
- ----------

HYperspectral viewer for Development of Research Applications - HYDRA

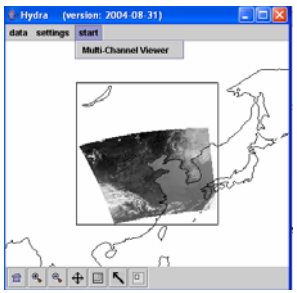
MSG,
GOES



MODIS,
AIRS, IASI,
CALIPSO



Freely available software
For researchers and educators
Computer platform independent
Extendable to more sensors and applications
Based in VisAD
(Visualization for Algorithm Development)
Uses Jython (Java implementation of Python)
runs on most machines
512MB main memory & 32MB graphics card suggested
on-going development effort



Developed at CIMSS by
Tom Rink
Tom Whittaker
Kevin Baggett

With guidance from
Paolo Antonelli
Liam Gumley
Paul Menzel
Allen Huang

CIMSS

http://www.ssec.wisc.edu/hydra/

HYDRA has been part of an effort for Environmental Literacy, Outreach, and Education

Schools on remote sensing have been held in
Bologna, Italy (Sep 01),
Rome, Italy (Jun 02),
Maratea, Italy (May 03),
Bertinoro, Italy (Jul 04),
Cape Town, South Africa (Apr 06),
Krakow, Poland (May 06),
Ostuni, Italy (Jun 06)