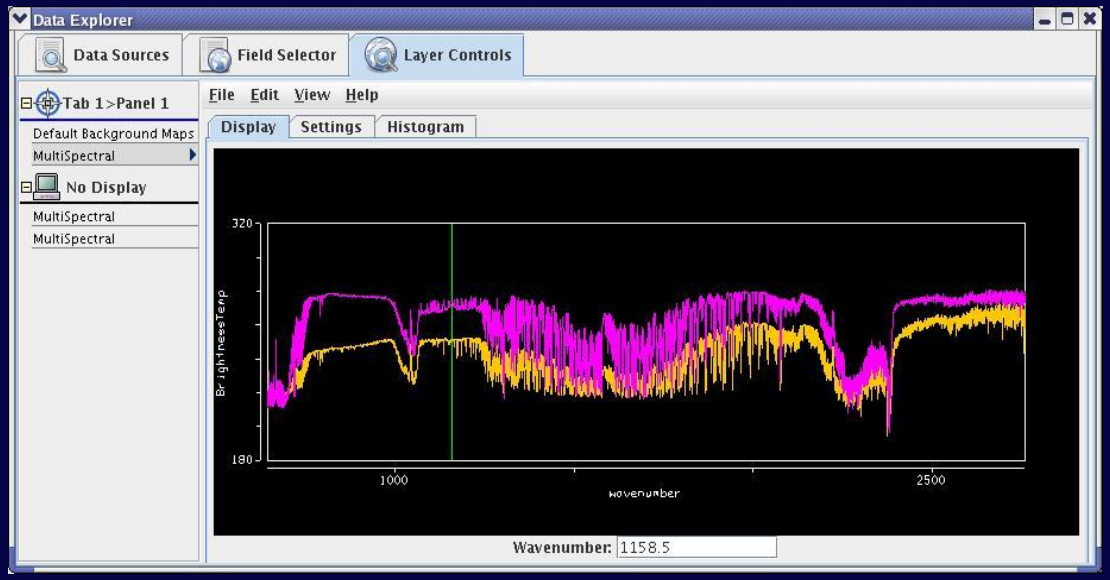
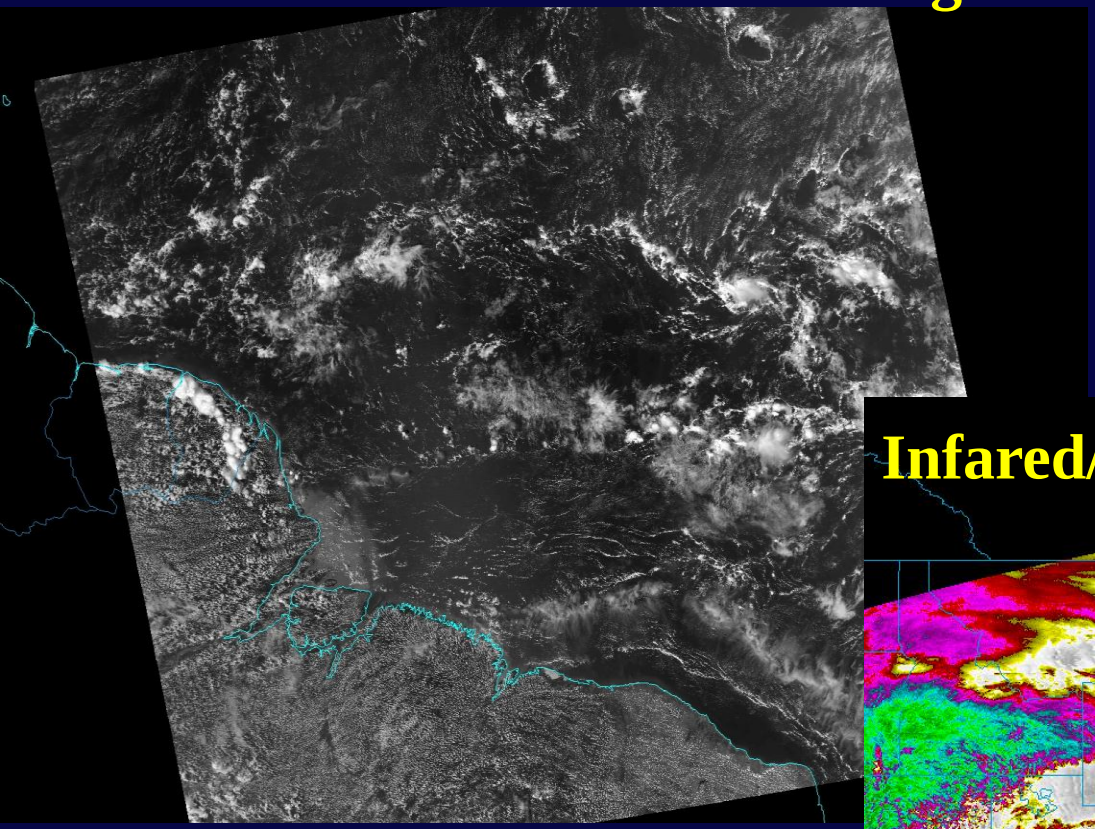
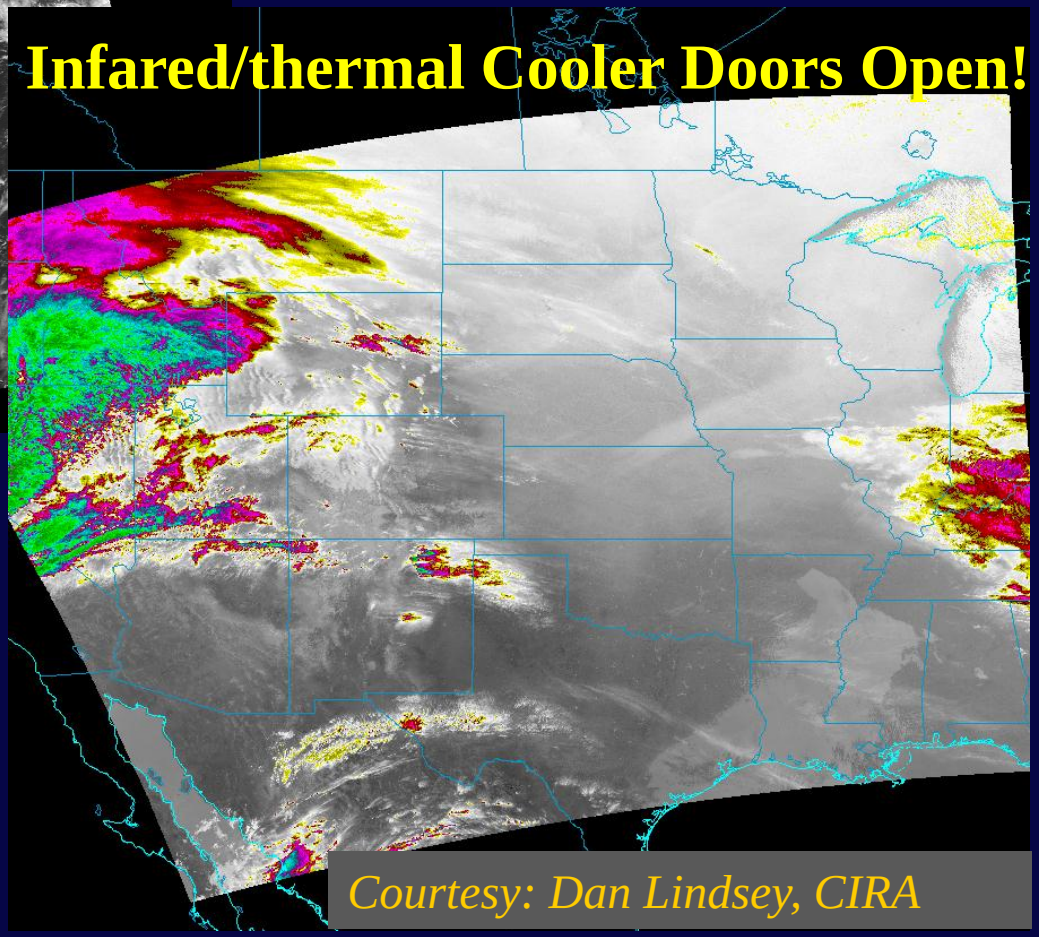
McIDAS-V
Visualization and Analysis for SuomiNPP

Tom Rink, Tommy Jasmin, Tom Achtor
SSEC/CIMSS

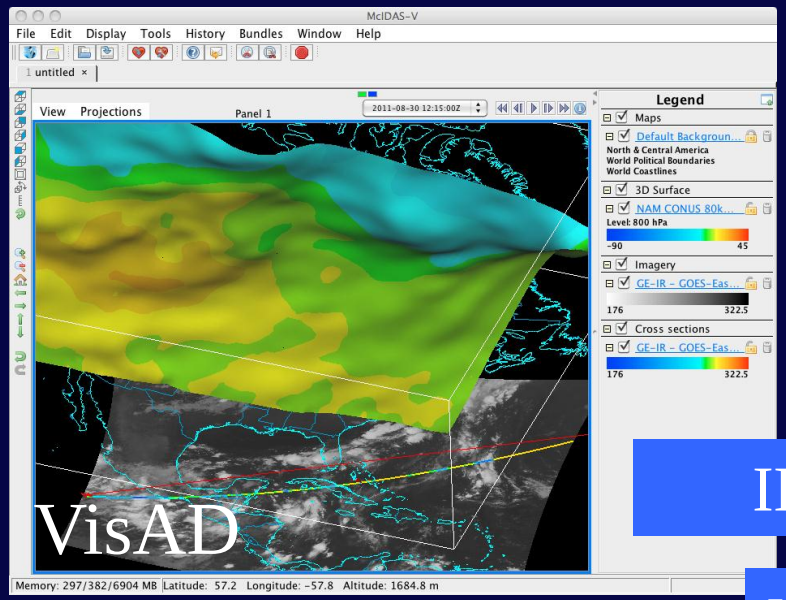


McIDAS-V Sees VIIRS First Light!



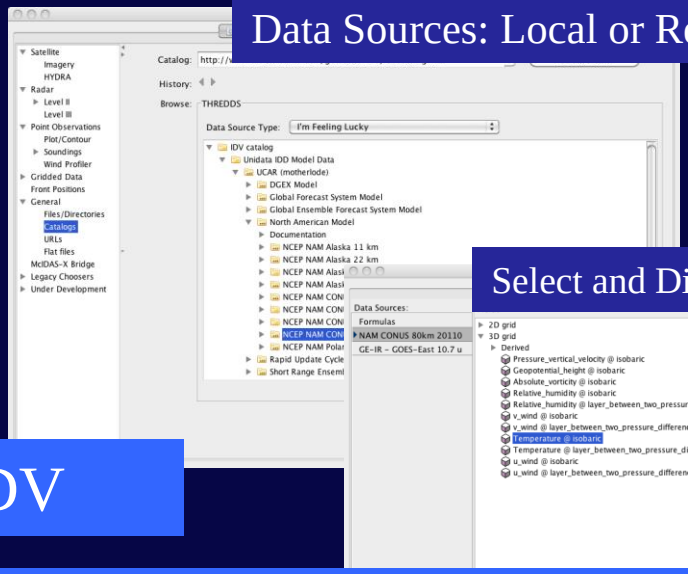


What is McIDAS-V



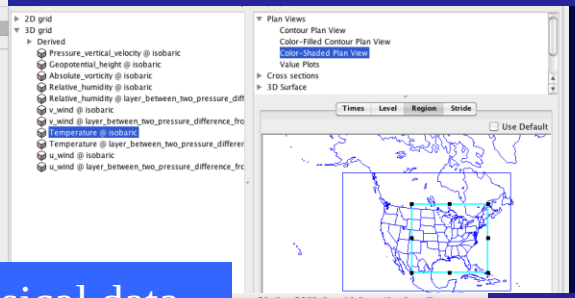
VisAD

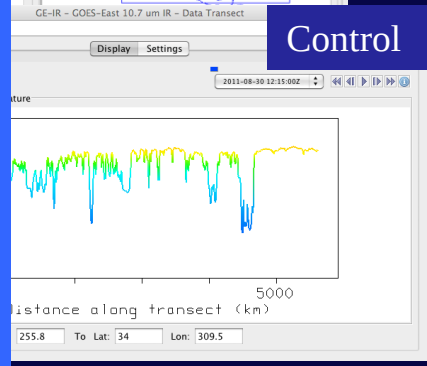
Data Sources: Local or Remote



IDV

Select and Display (image, slice, probe)



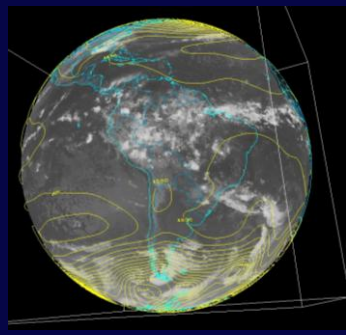


Control

- Interaction(rotate,zoom,pan, manipulate)
- Animation
- Abstract Data Model
- Rendering 3D/2D

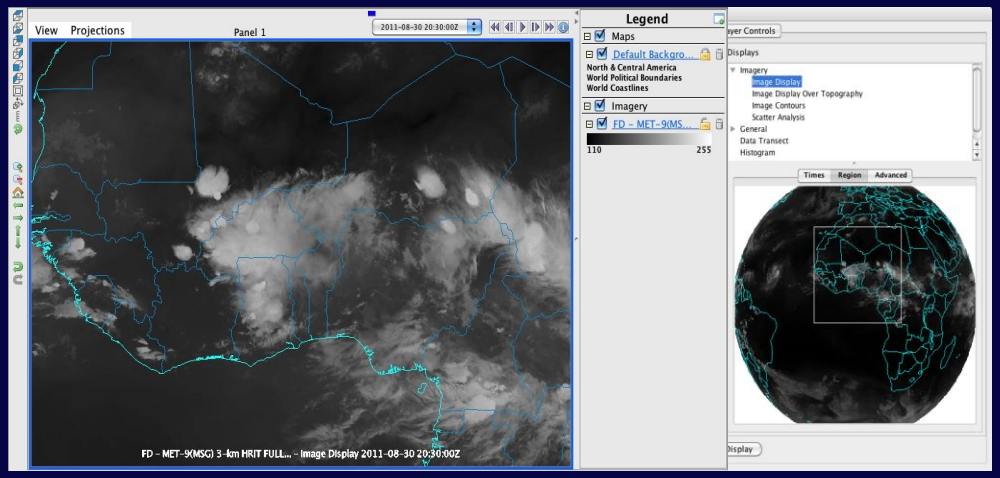
- Wide array of Geophysical data.
- UI components for selecting data and controlling appearance.
- User defined computation, Jython

- Java based: portable easy to install
- Freely available, open source software.



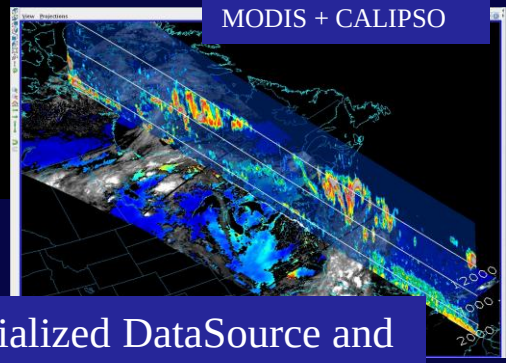
McIDAS-V

Satellite Imagery Enhancements



GEO + LEO

SGP4 Orbit Calc



MODIS + CALIPSO

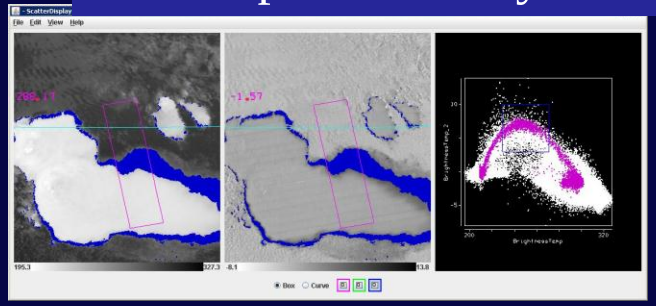
Specialized DataSource and Display Extensions

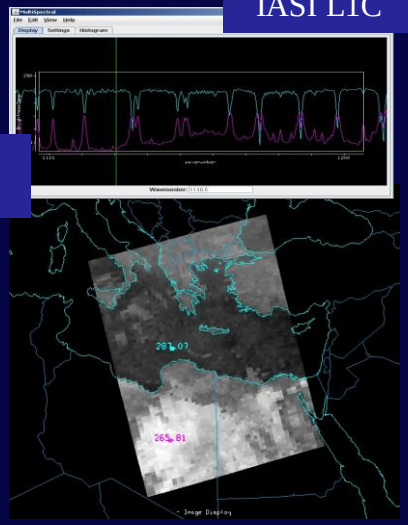
- Graphical Region sub-setting
- Improved Rendering performance (long sequences or very large images)

Simplified Programming Environment

- All Python scripting, not XML based
- High-Level functions for configuring displays.

Multi-Spectral Analysis





IASI L1C

Local

Remote

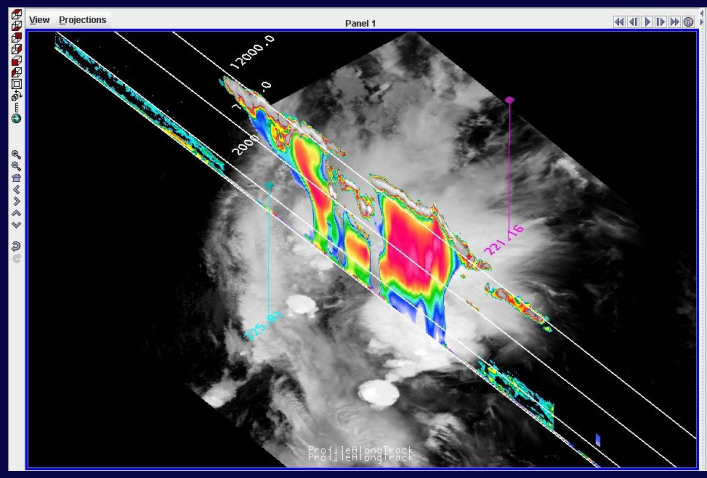
Extendable framework for adapting new sources of data, user interface components and creating novel displays.

NetCDF, HDF, GRIB, BUFR, GIS

OpenDAP, ADDE

Adapters

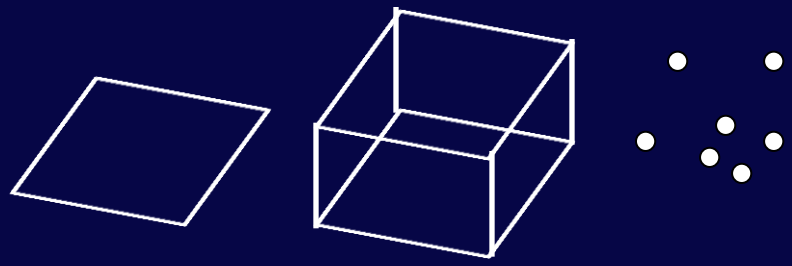
Displays



Tuple (Temp, RH, Lon, Lat)

Grid 2D/3D

Time

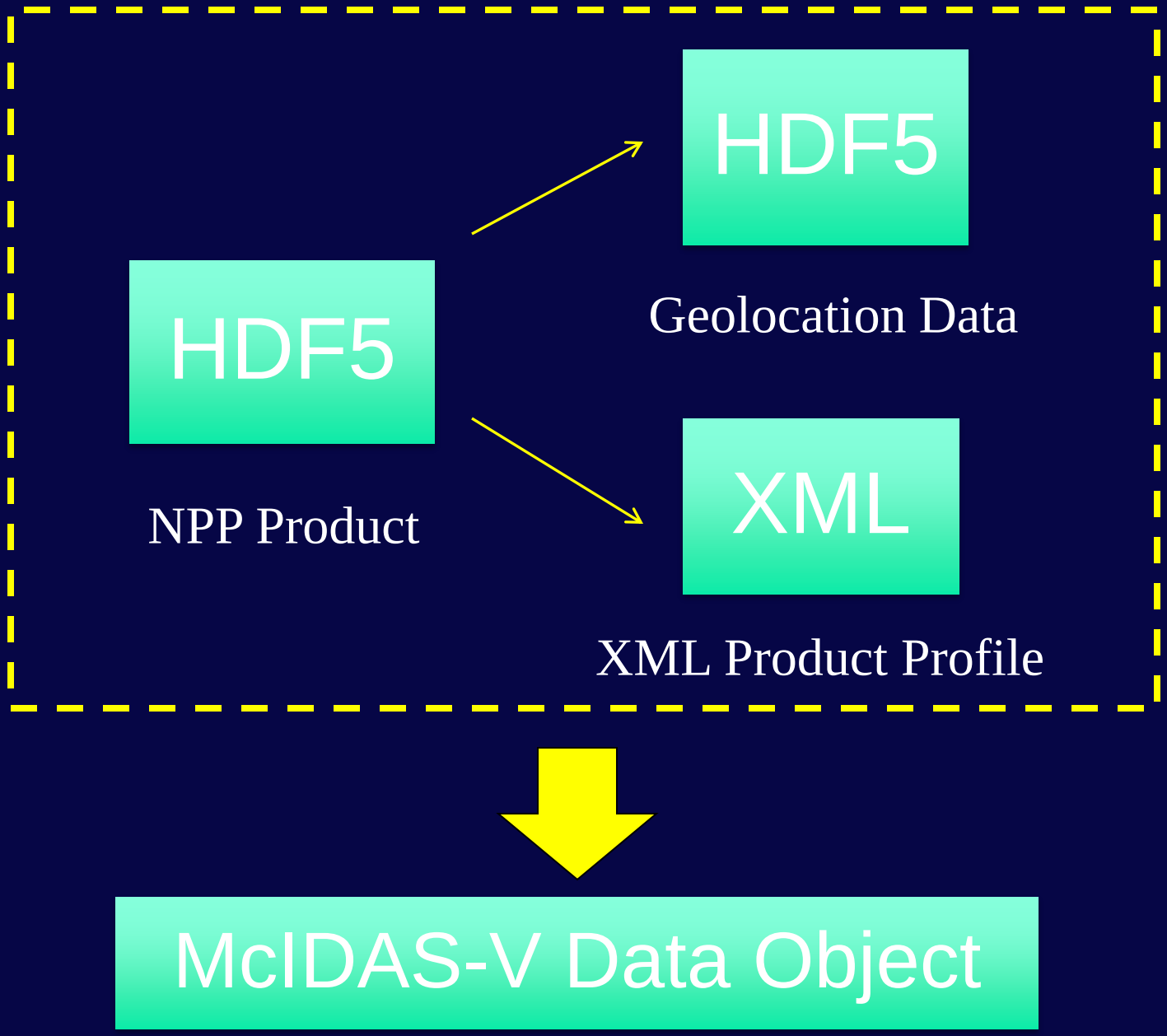


Metadata

Coordinate System: (x,y) -> (lon,lat), (Altitude->Pressure)

Units: hPa, Kelvin, degrees, etc.

SuomiNPP Data Source Object

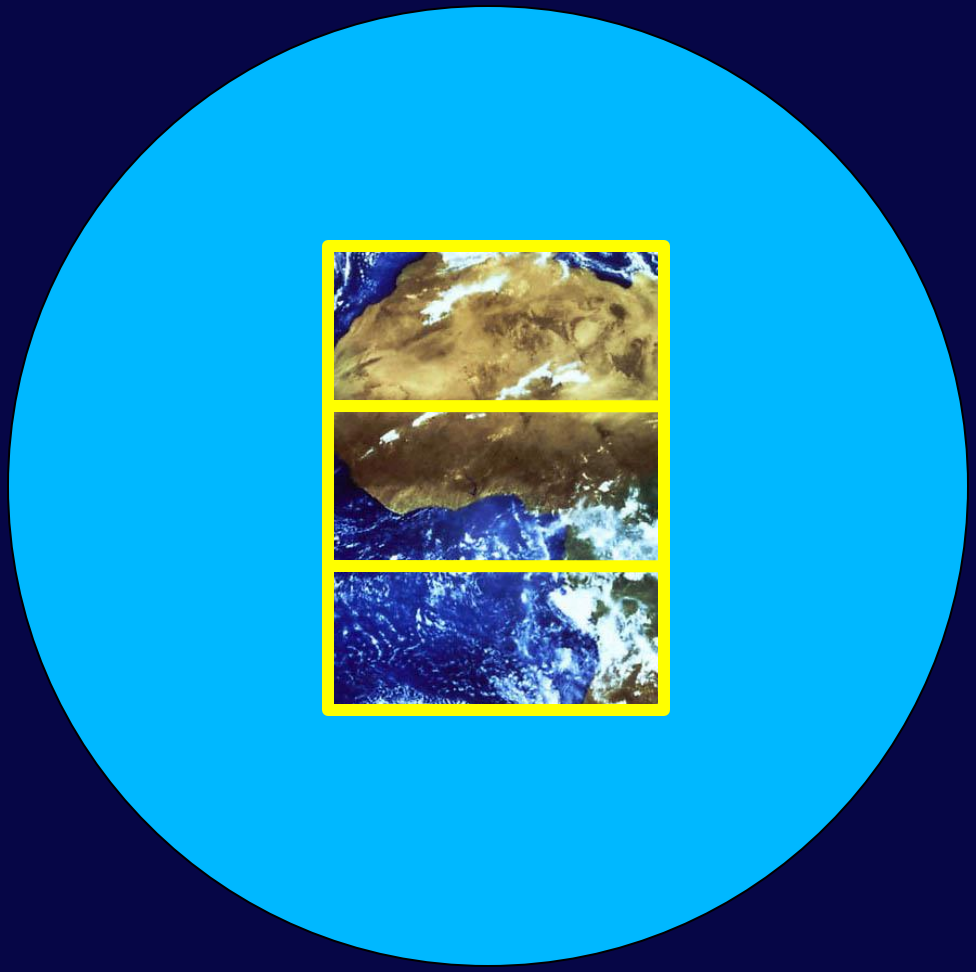


Granule Aggregator

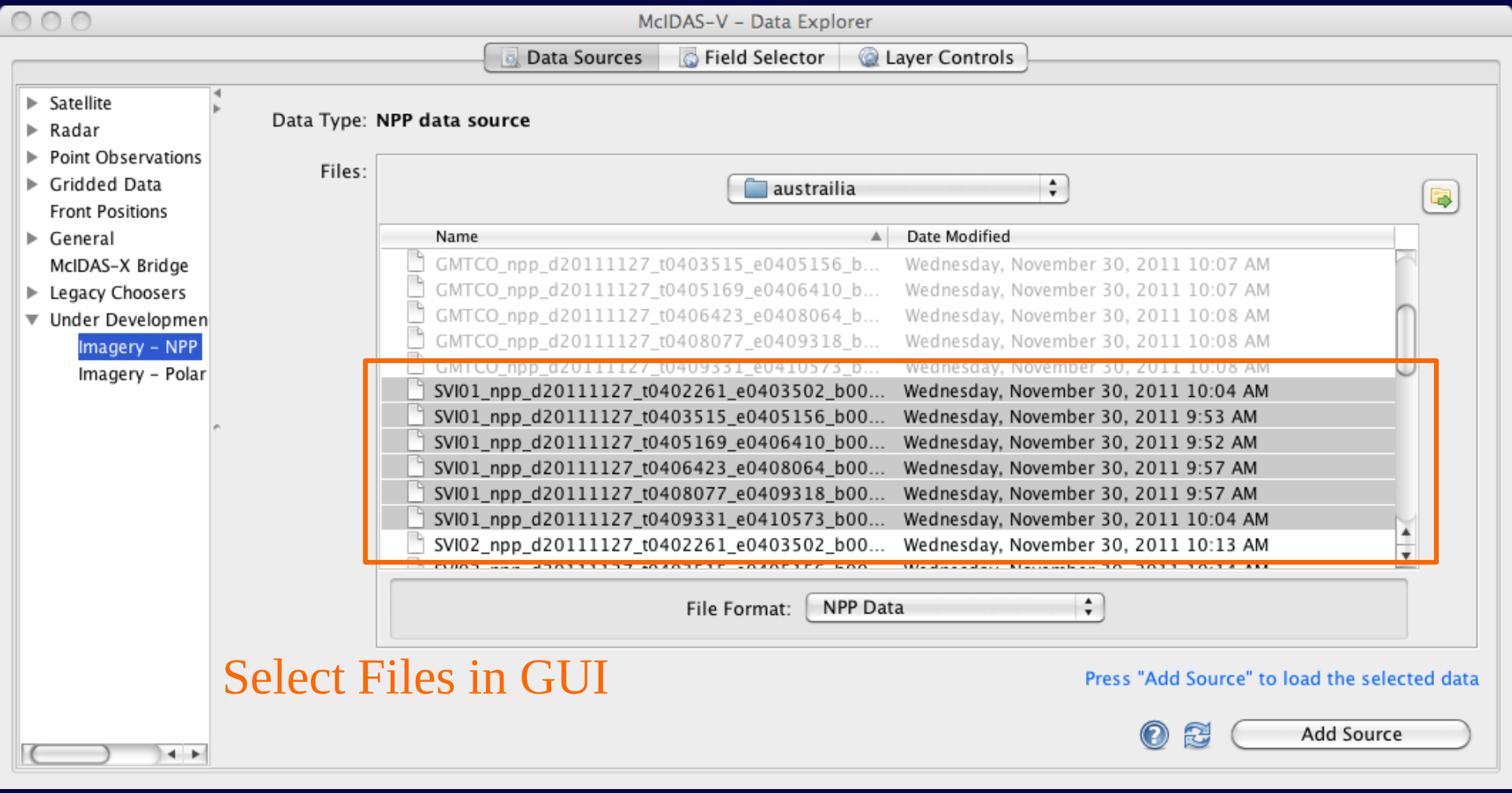
Lets user select arbitrary set of granules for display.

Once loaded, the full McIDAS-V capabilities are available, including:

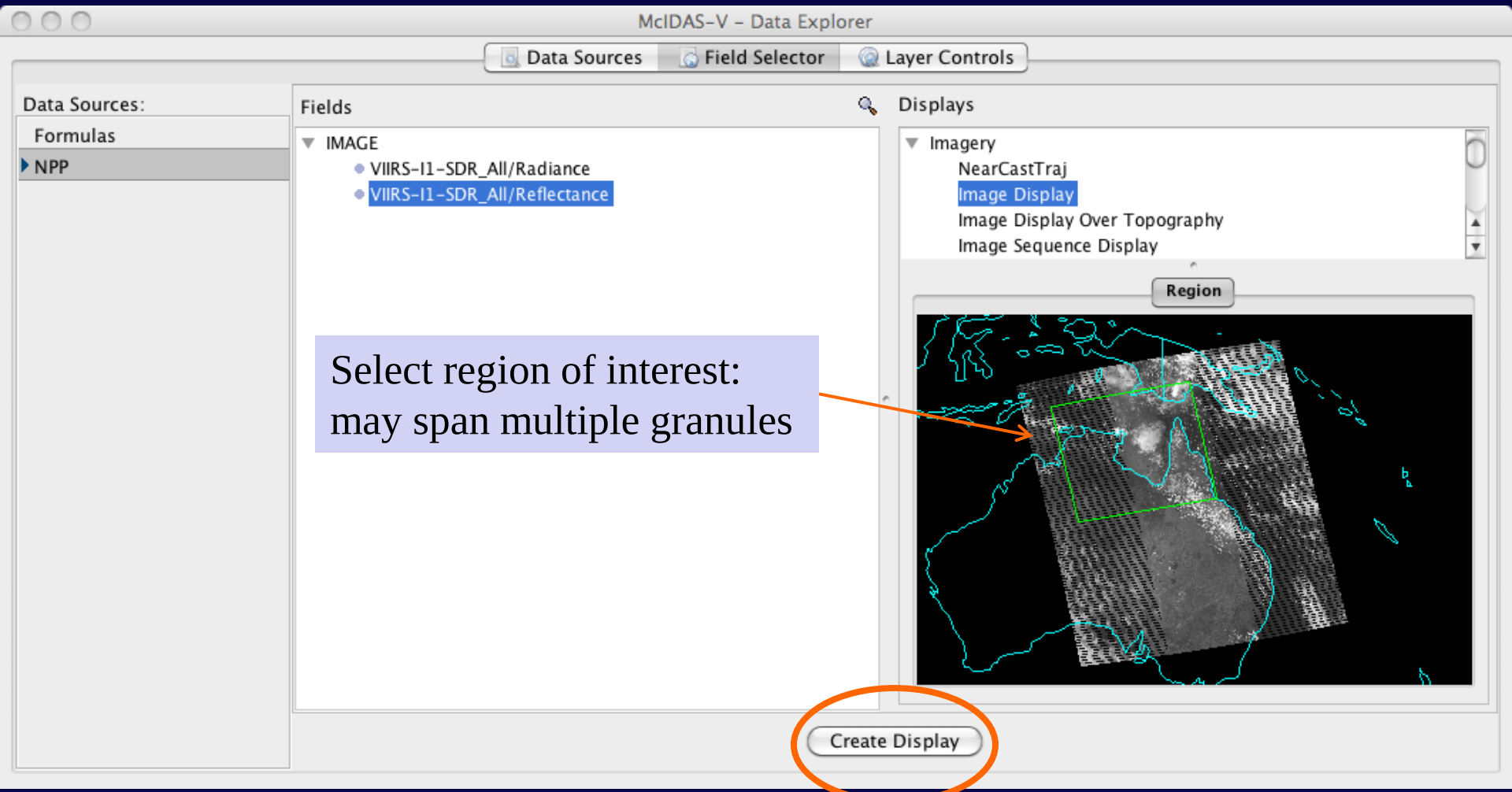
- Sub-setting
- Reprojecting
- Formulas
- Saving data



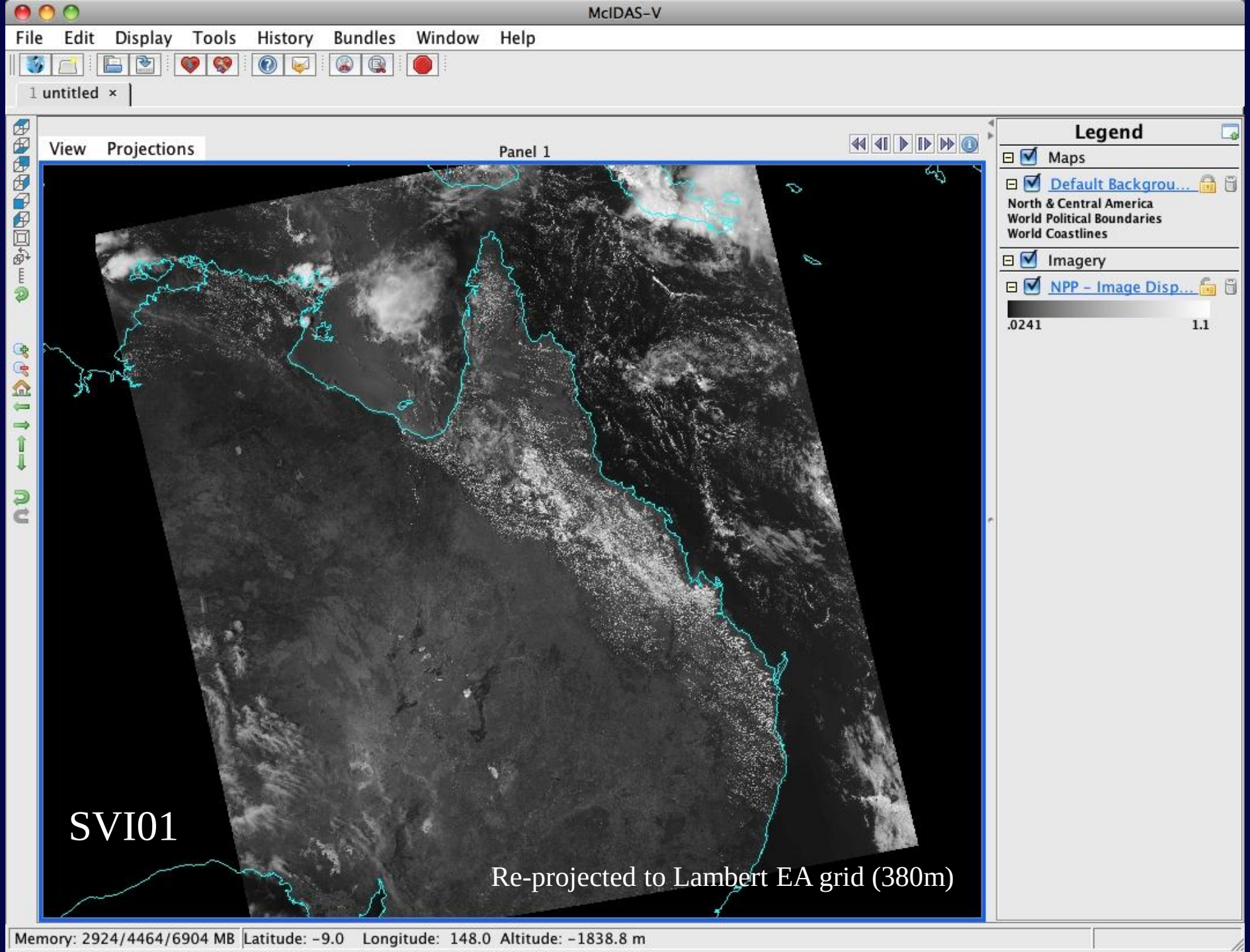
Example with the real data

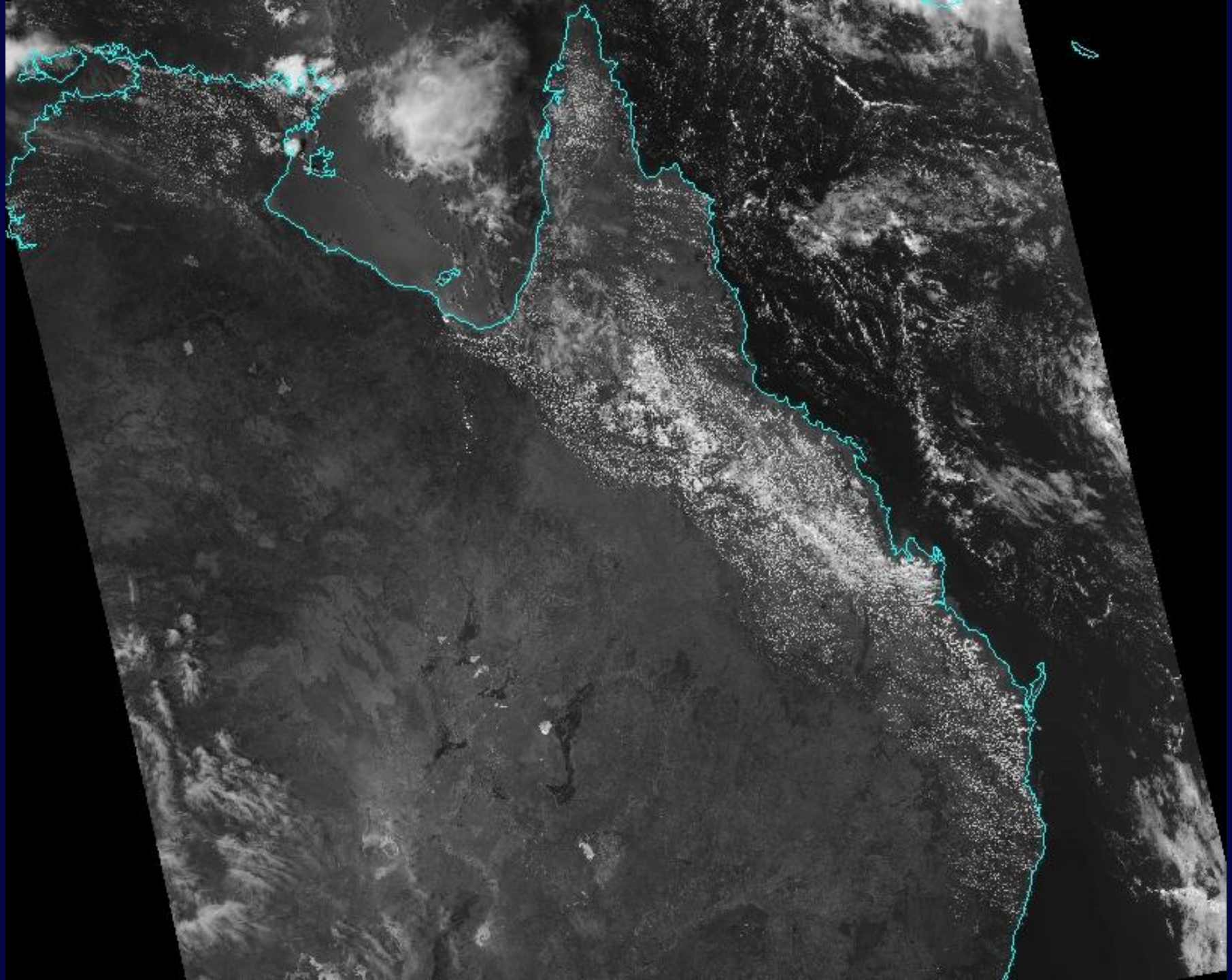


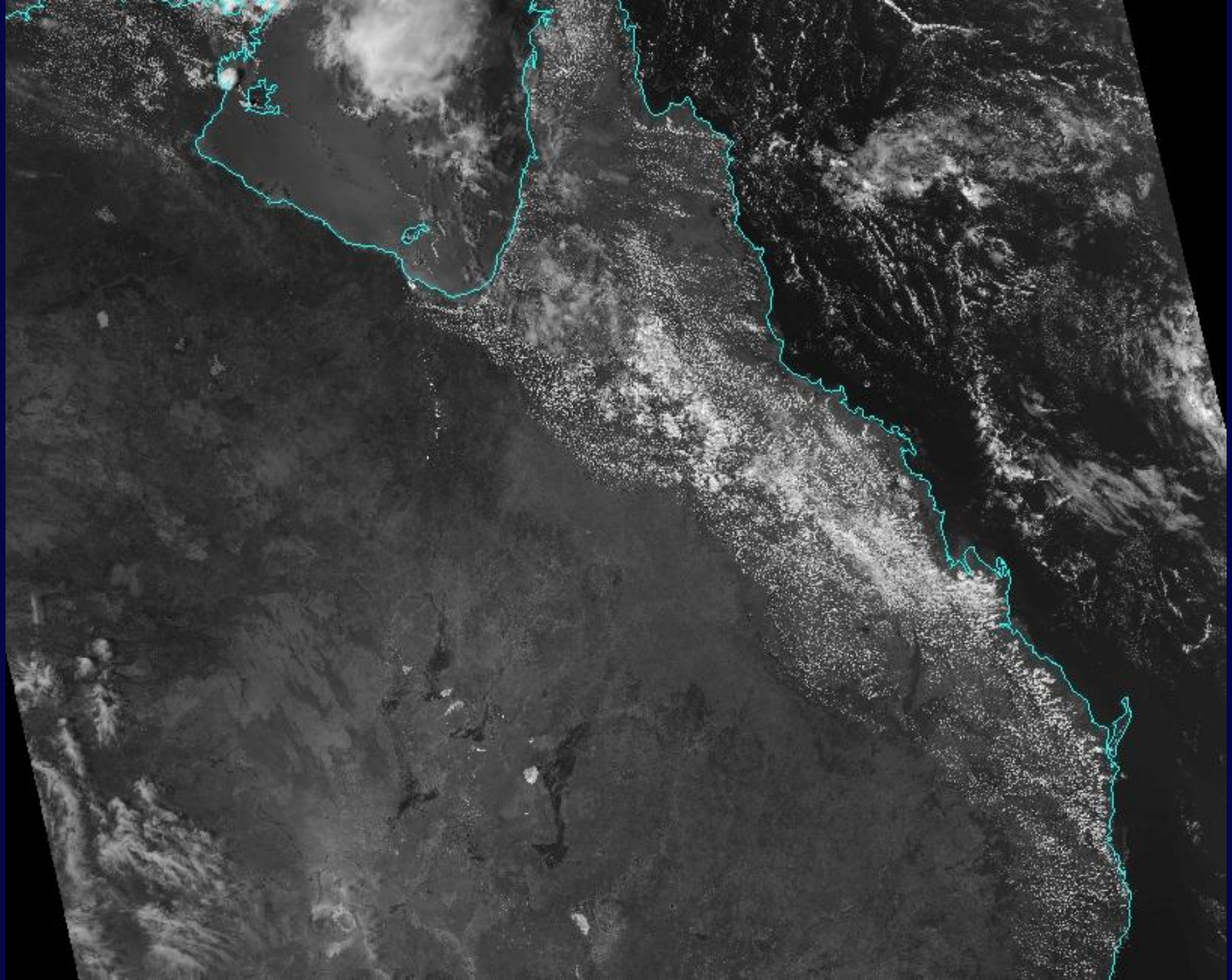
Select Files in GUI

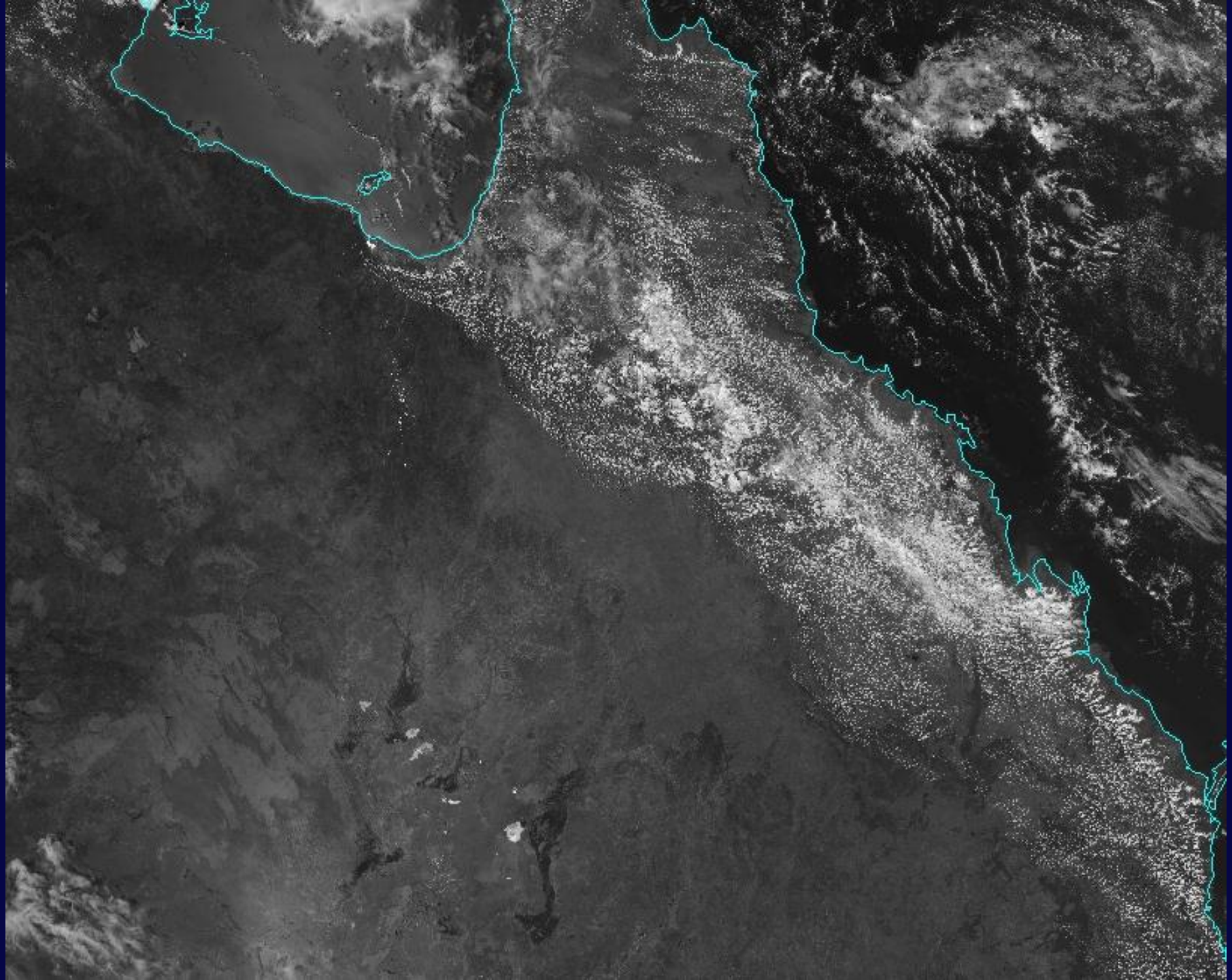


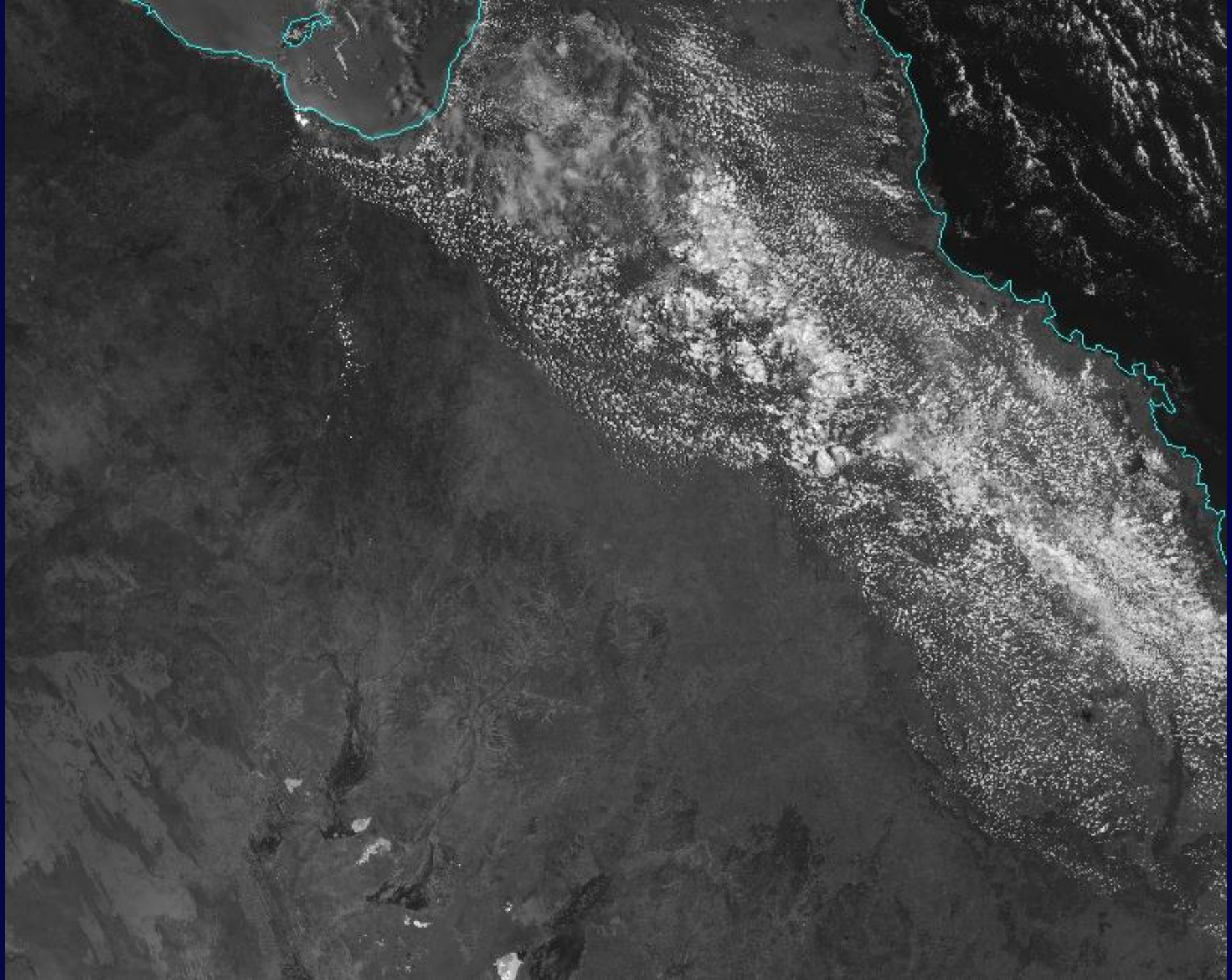
Select region of interest: may span multiple granules

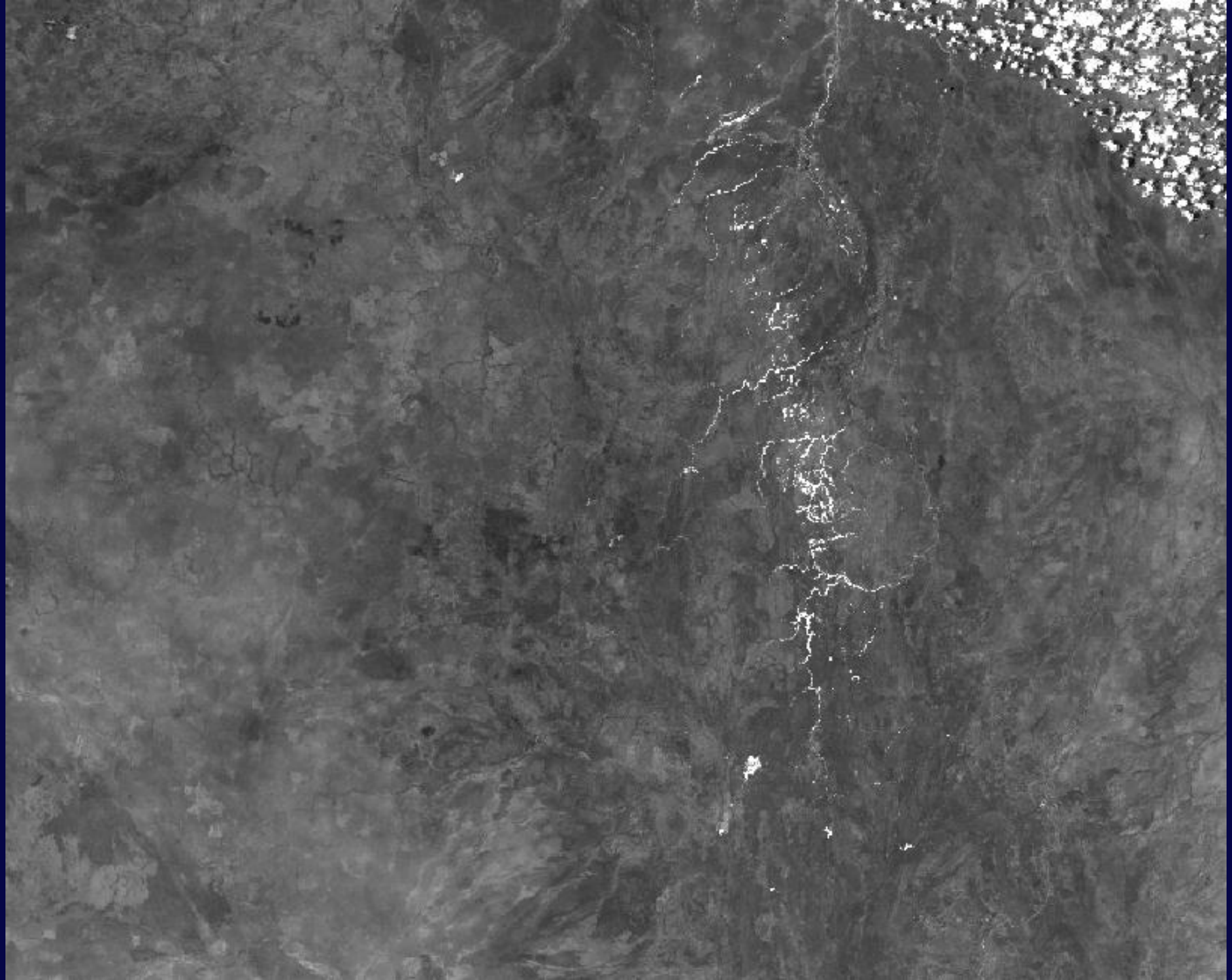

McIDAS-V
File Edit Display Tools History Bundles Window Help
1 untitled
View Projections
Panel 1
Legend
Maps
Default Backgrou...
North & Central America
World Political Boundaries
World Coastlines
Imagery
NPP - Image Disp...
.0241
1.1
SVI01
Re-projected to Lambert EA grid (380m)
Memory: 2924/4464/6904 MB
Latitude: -9.0 Longitude: 148.0 Altitude: -1838.8 m

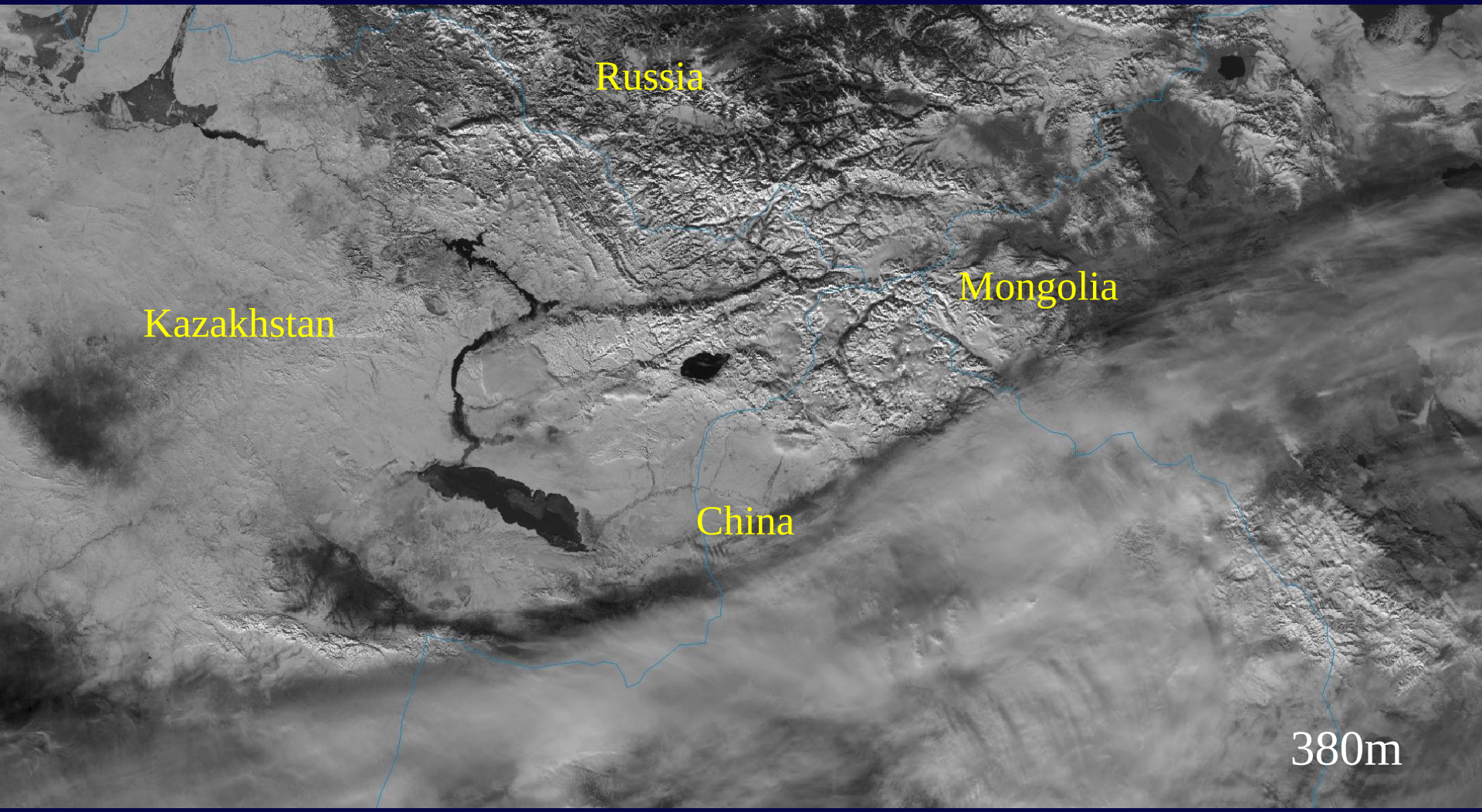




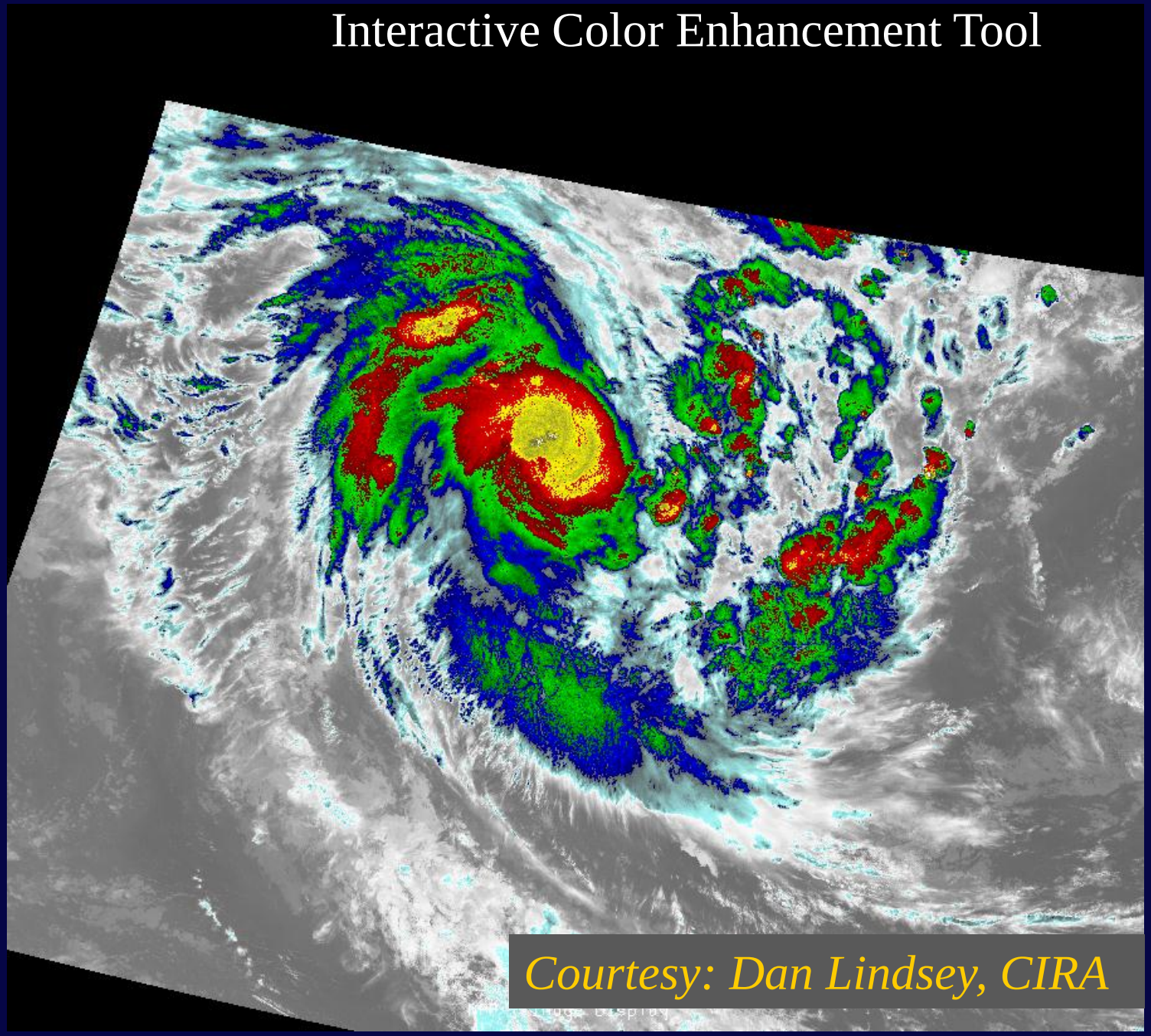


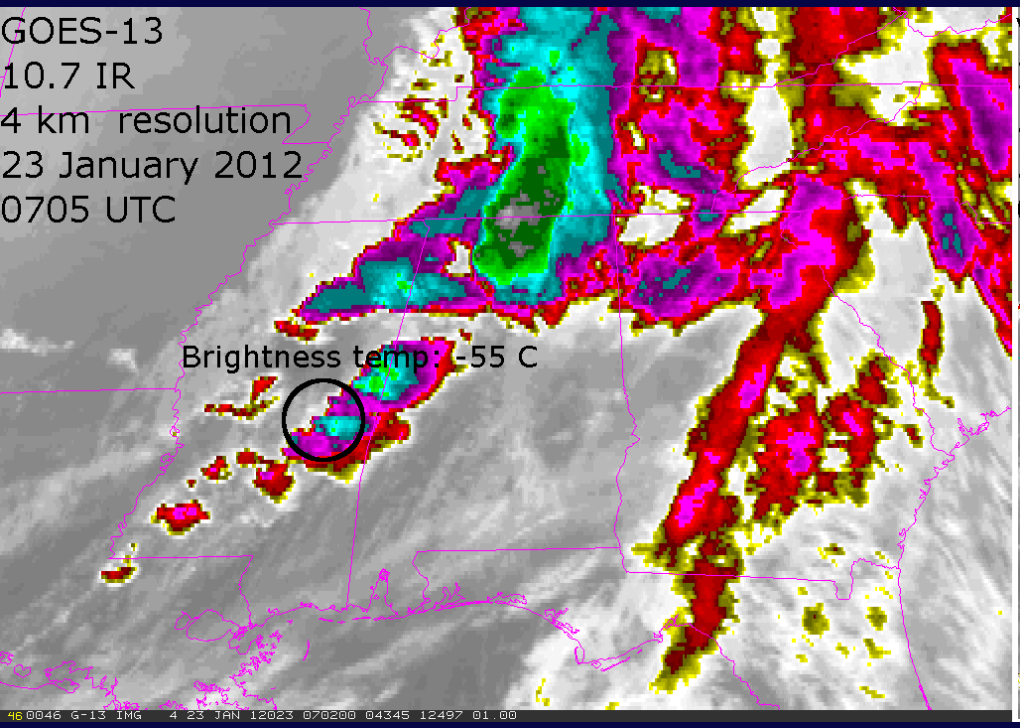


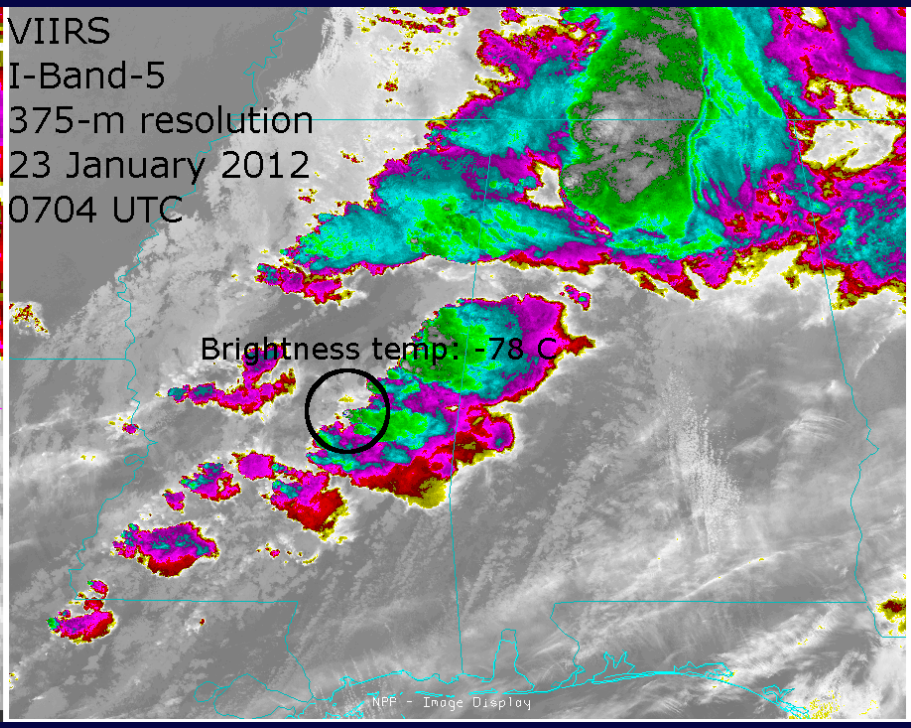



Russia
Mongolia
Kazakhstan
China
380m

Interactive Color Enhancement Tool

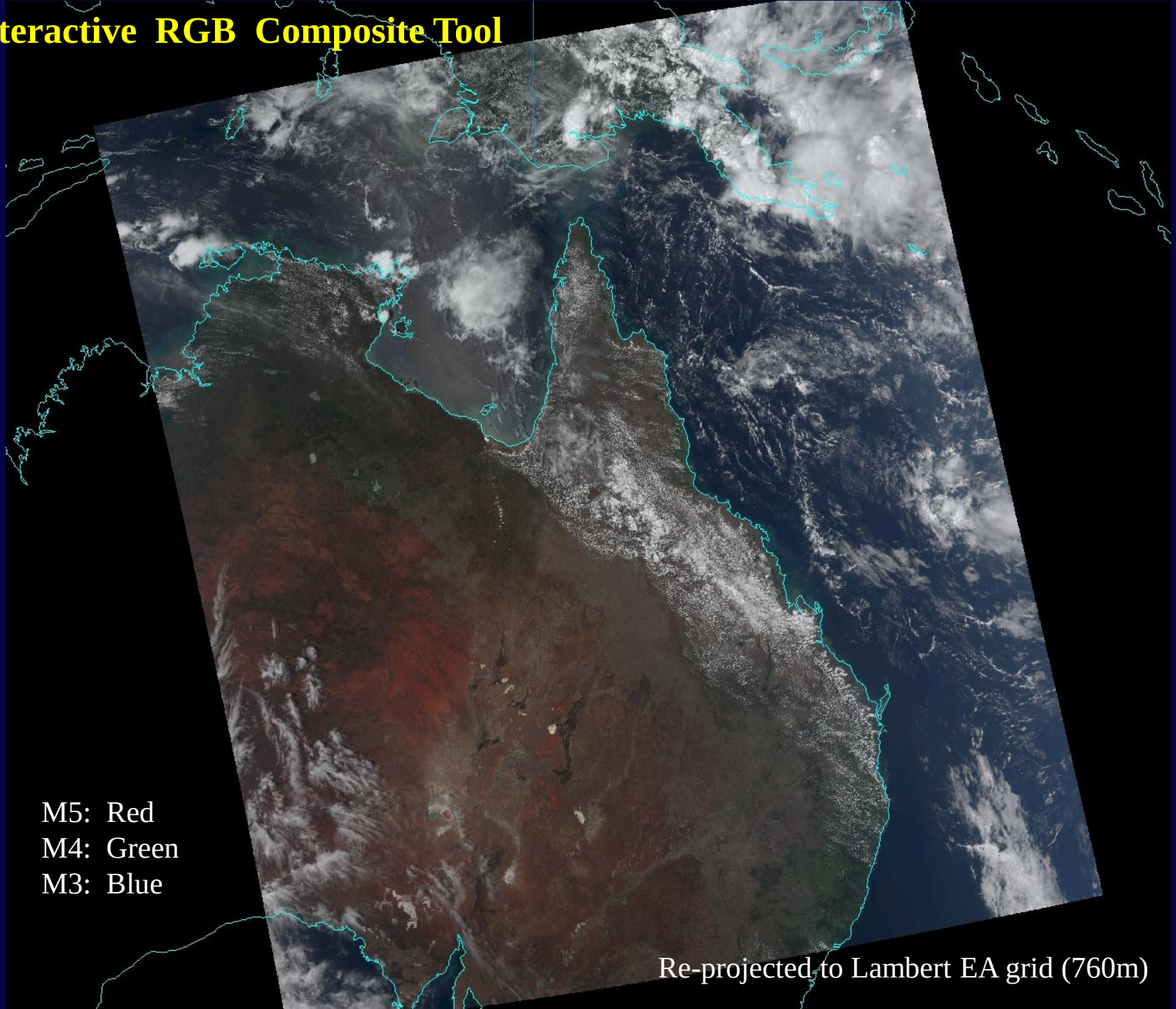


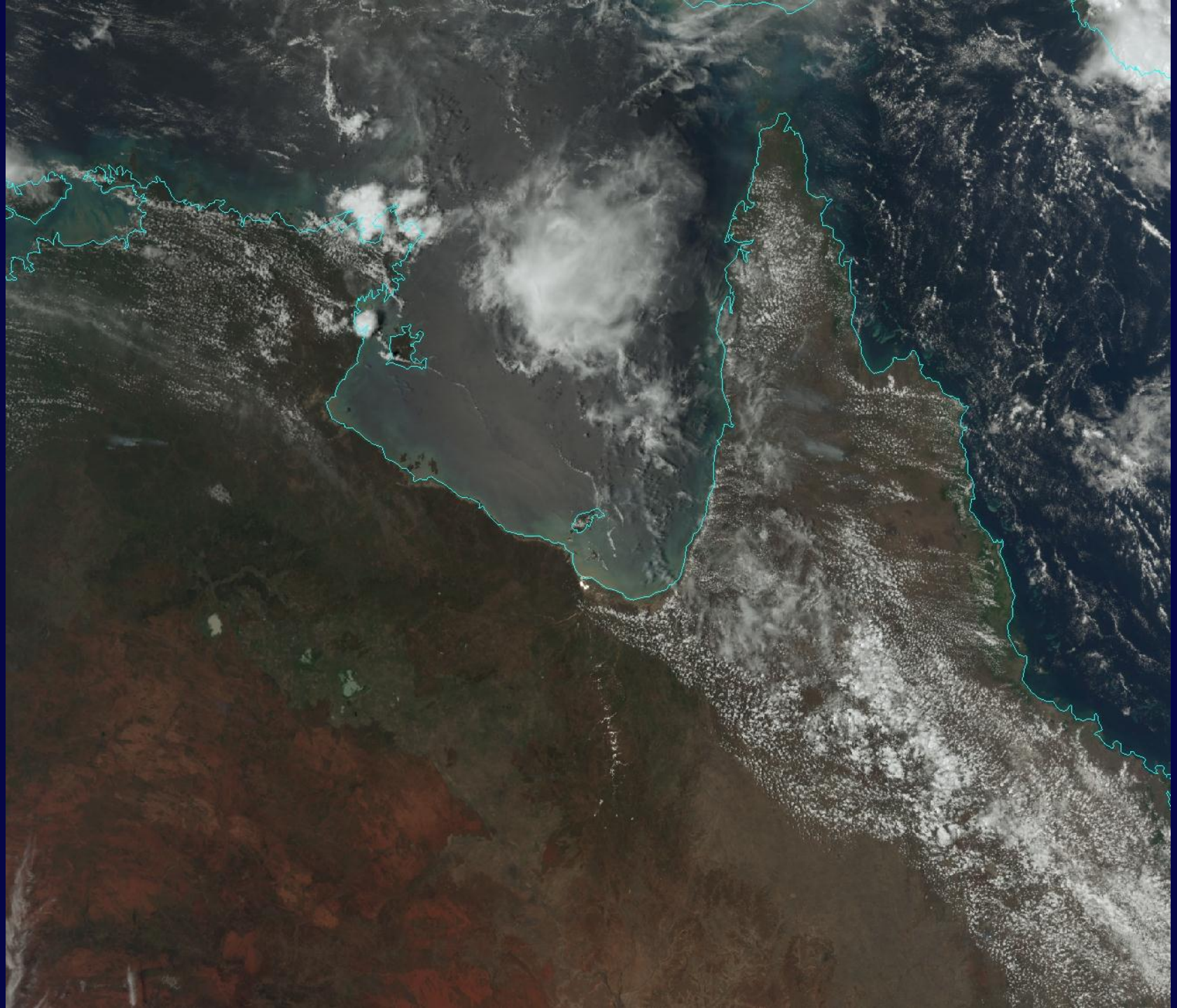




Courtesy: Dan Lindsey, CIRA

Interactive RGB Composite Tool





User Defined Computation

Jython libraries

File Help

Local Jython
System
Temporary

User's library

```
#-- Import Java classes

from visad import Data, RealType, Gridded2DSet, Gridded3DSet, FlatField, FieldImpl, RealTupleType
from ucar.visad import GeoUtils, Util
from visad.data.vis5d import Vis5DVerticalSystem
from java.lang import Float
from edu.wisc.ssec.mcidasv.data.hydra import MODIS_L1B_Utility
from edu.wisc.ssec.mcidasv.data.hydra import MultiSpectralDataSource



def brightnessTempToRadiance(image, bandNumber):
  #-- copy incoming object
  image = image.clone()

  #-- access the image values
  values = image.getFloats()

  #-- use Java utility class to convert BT to radiance at central wavelength of band
  radVals = MODIS_L1B_Utility.brightnessTemp_to_radiance(values, int(bandNumber))

  #-- set the new range to the image object (FlatField)
  image.setSamples(radVals)

  return image
```

Save

Find: Match case

Seamless integration between Jython and Java.

Data Model: can internalize any numerical information.

Built-in meta-data for units, coordinate systems and sampling topology (grid/point)

Work with Data in abstract terms, irrespective of original data source

Hook output into Framework via a Formula

Formula Editor

Name: BTtoRad

Formula: brightnessTempToRadiance(BT, bandNumber[isuser=true])

Advanced

Settings | Derived

Description: convert image BT to radiance

Group:

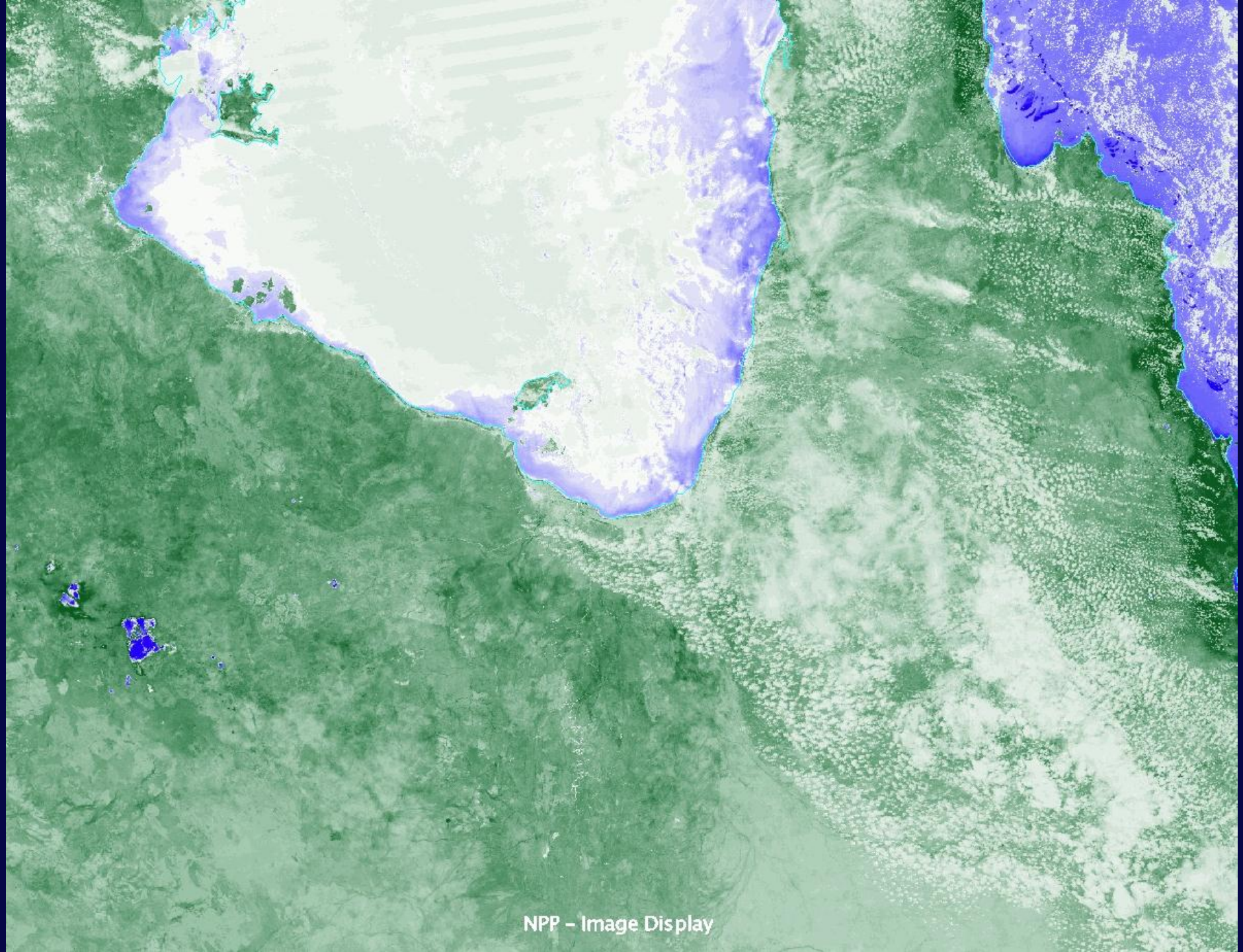
Displays: Use all / Use selected:

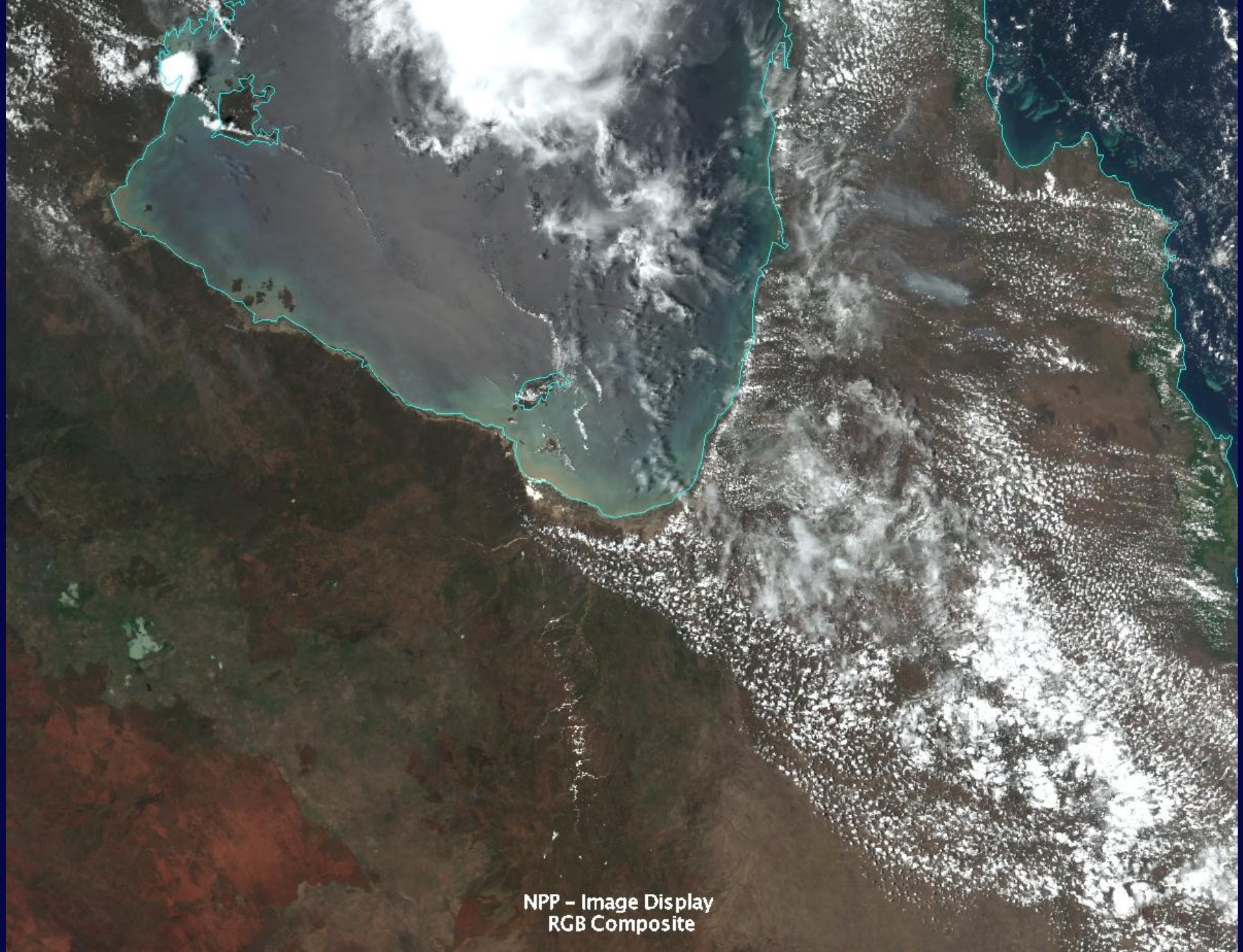
All on
All off

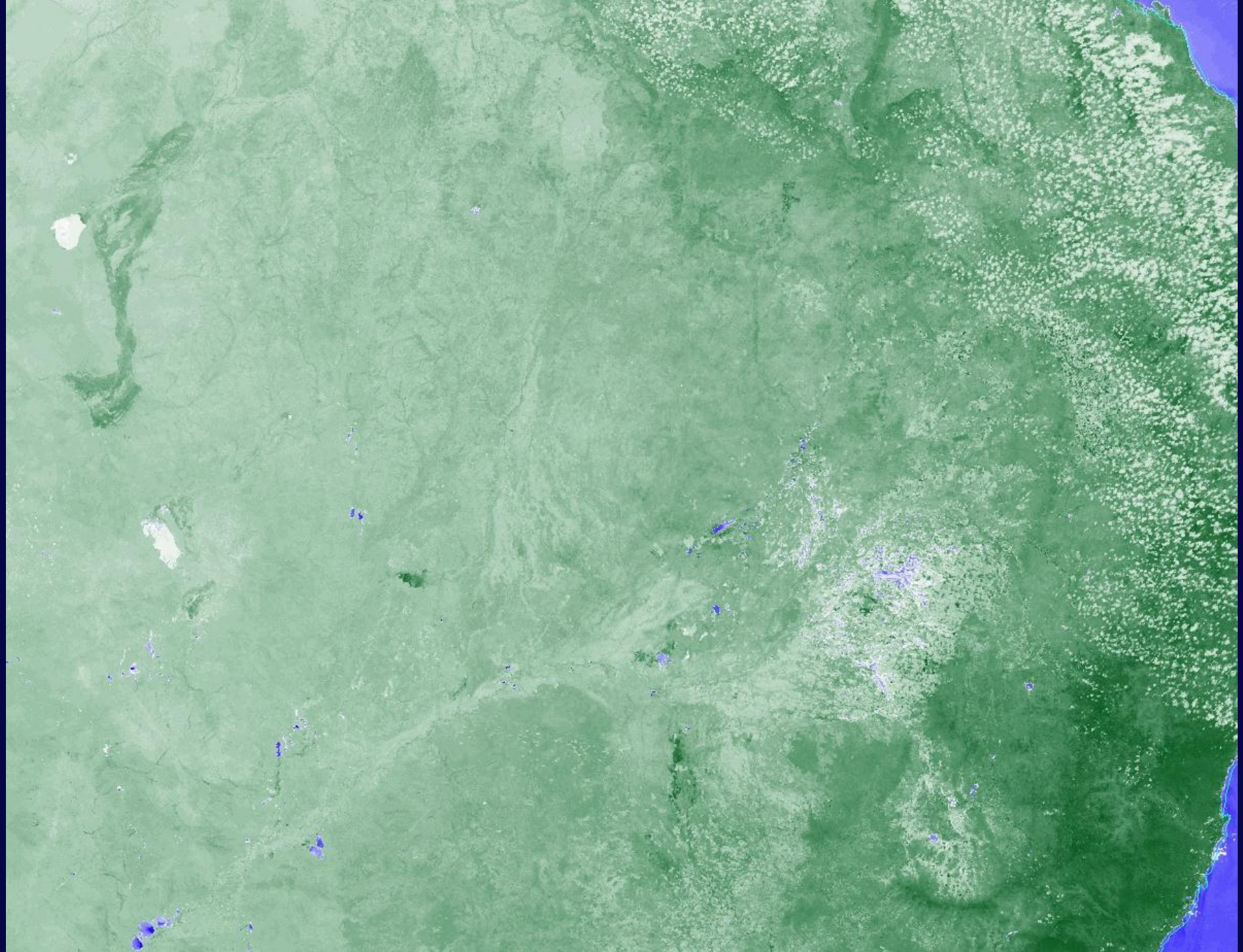
Imagery
Plan Views
Radar Displays

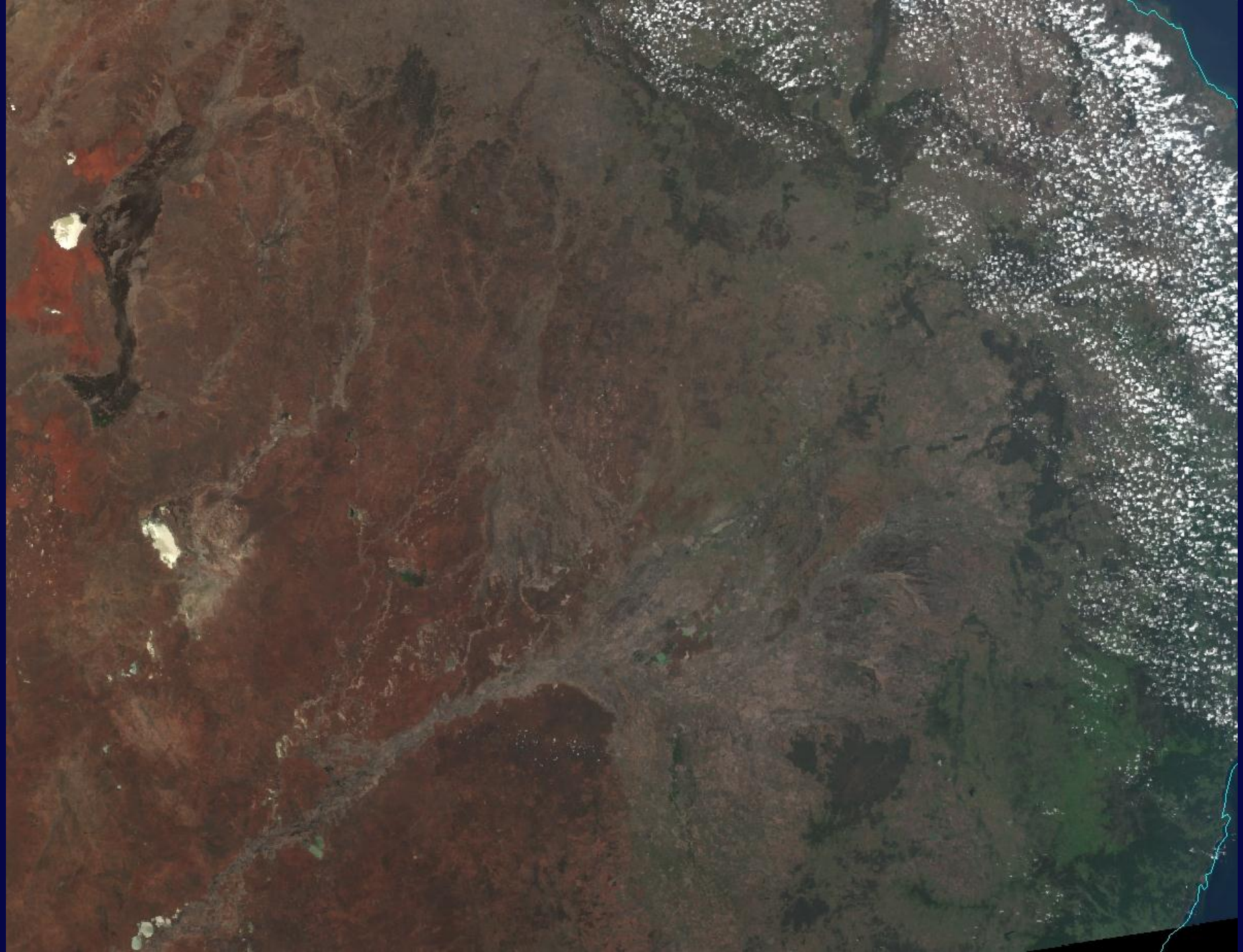
Change Formula | Remove Formula | Cancel | Help

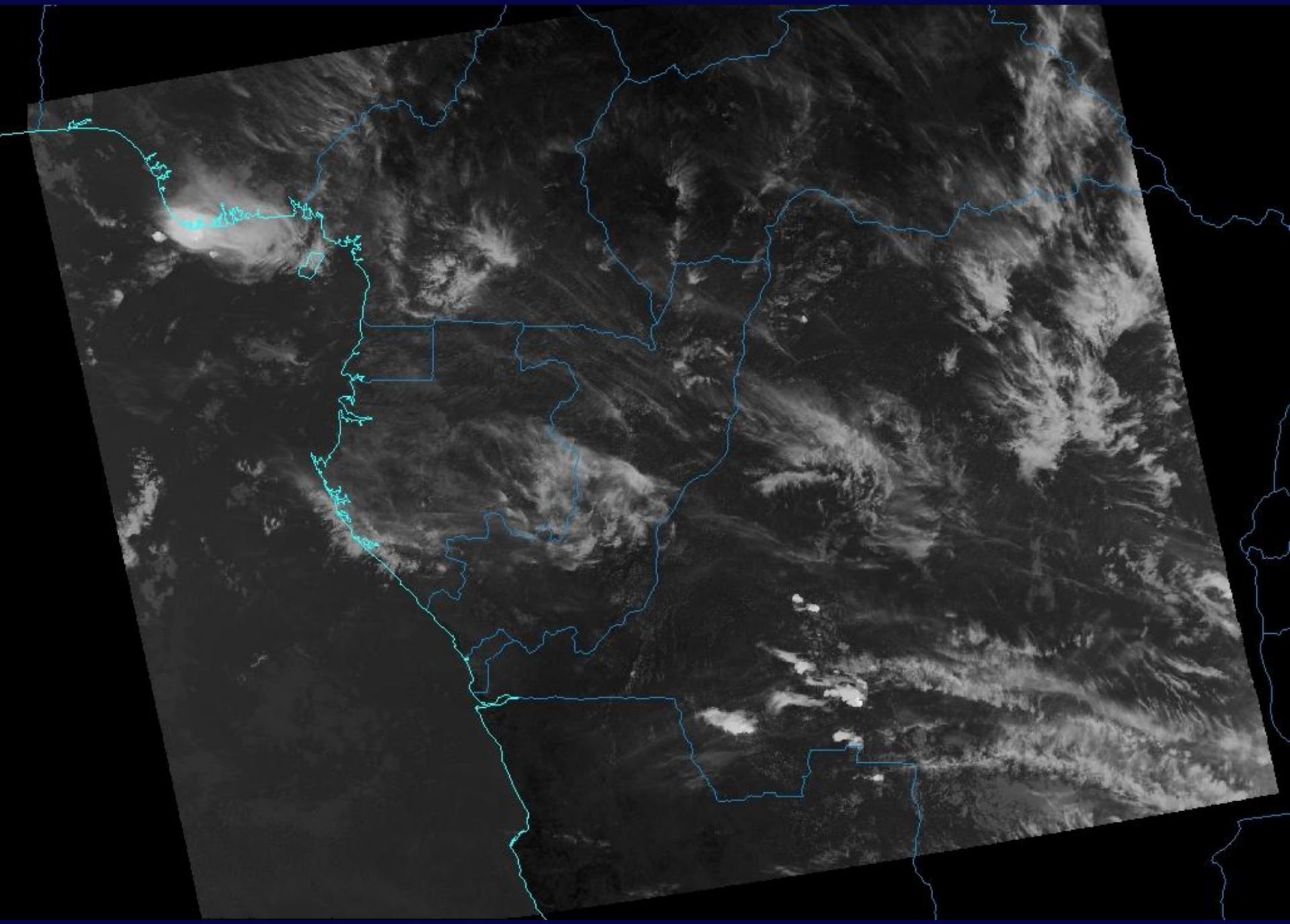
Compute and Display

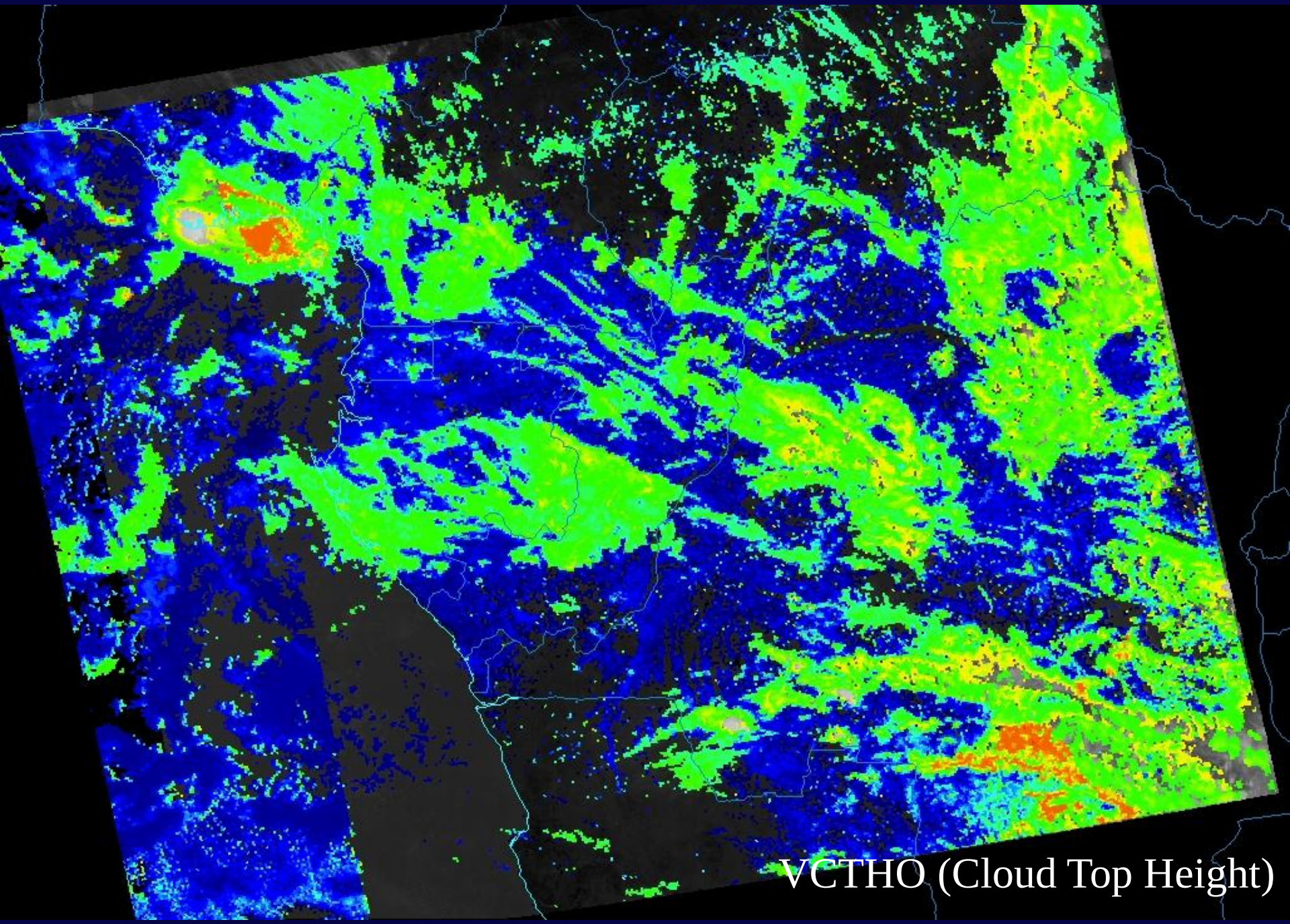

NPP – Image Display


NPP – Image Display
RGB Composite

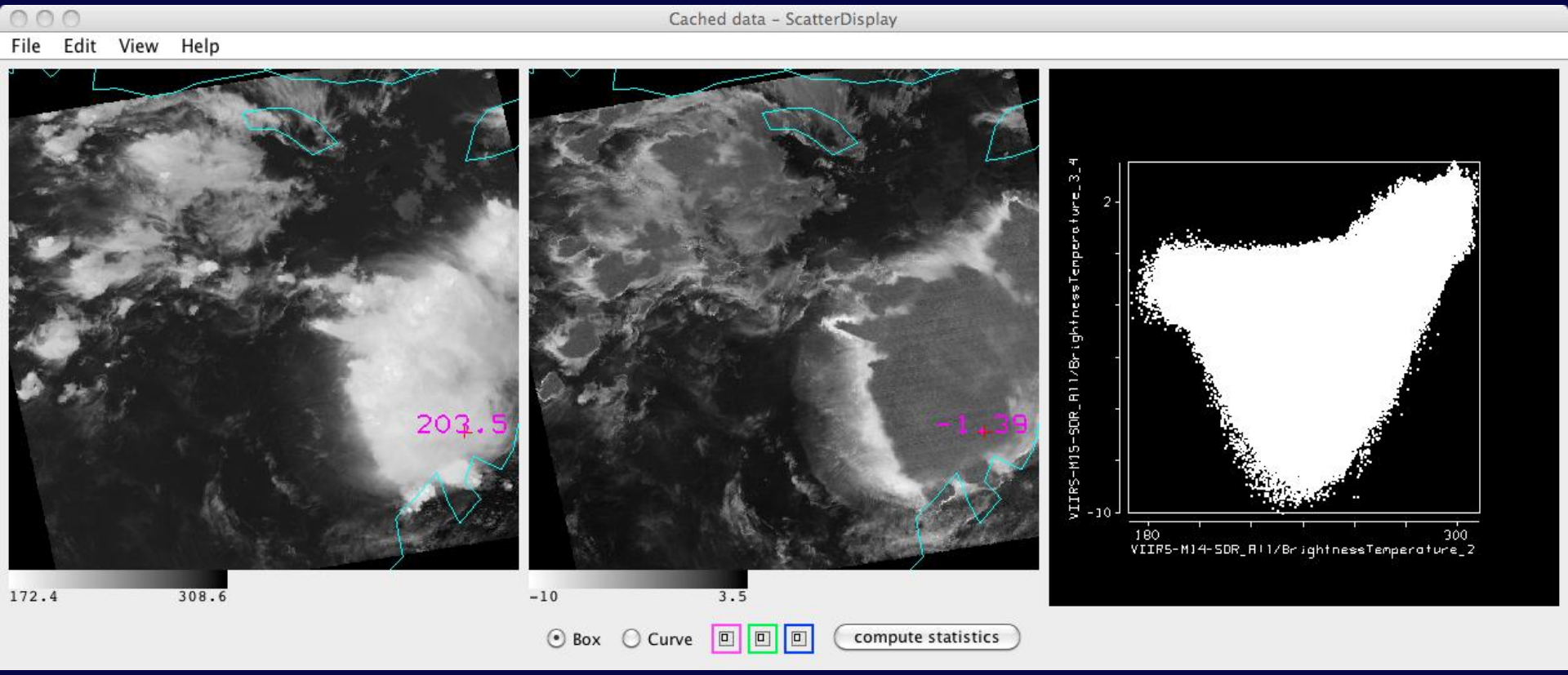






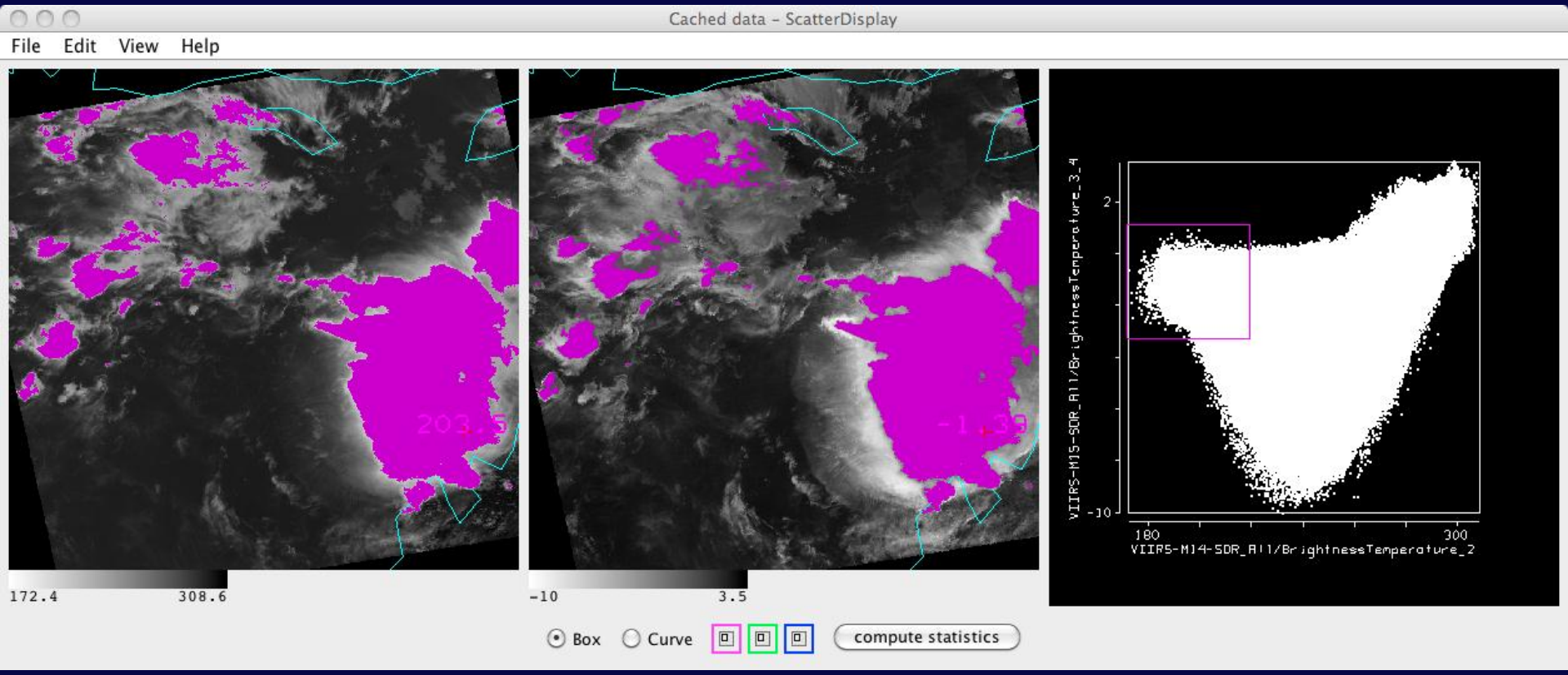

VCTHO (Cloud Top Height)

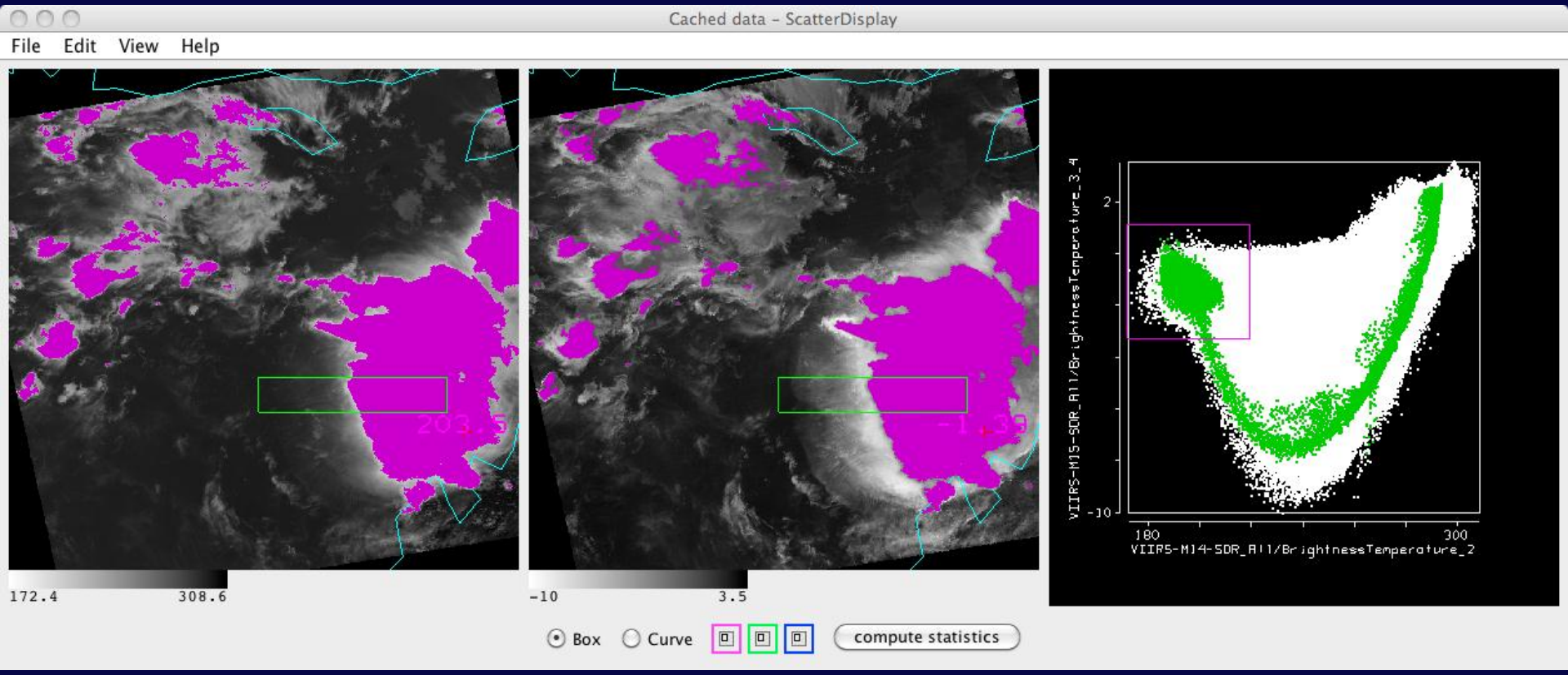
Interactive Analysis/Data Interrogation Tools



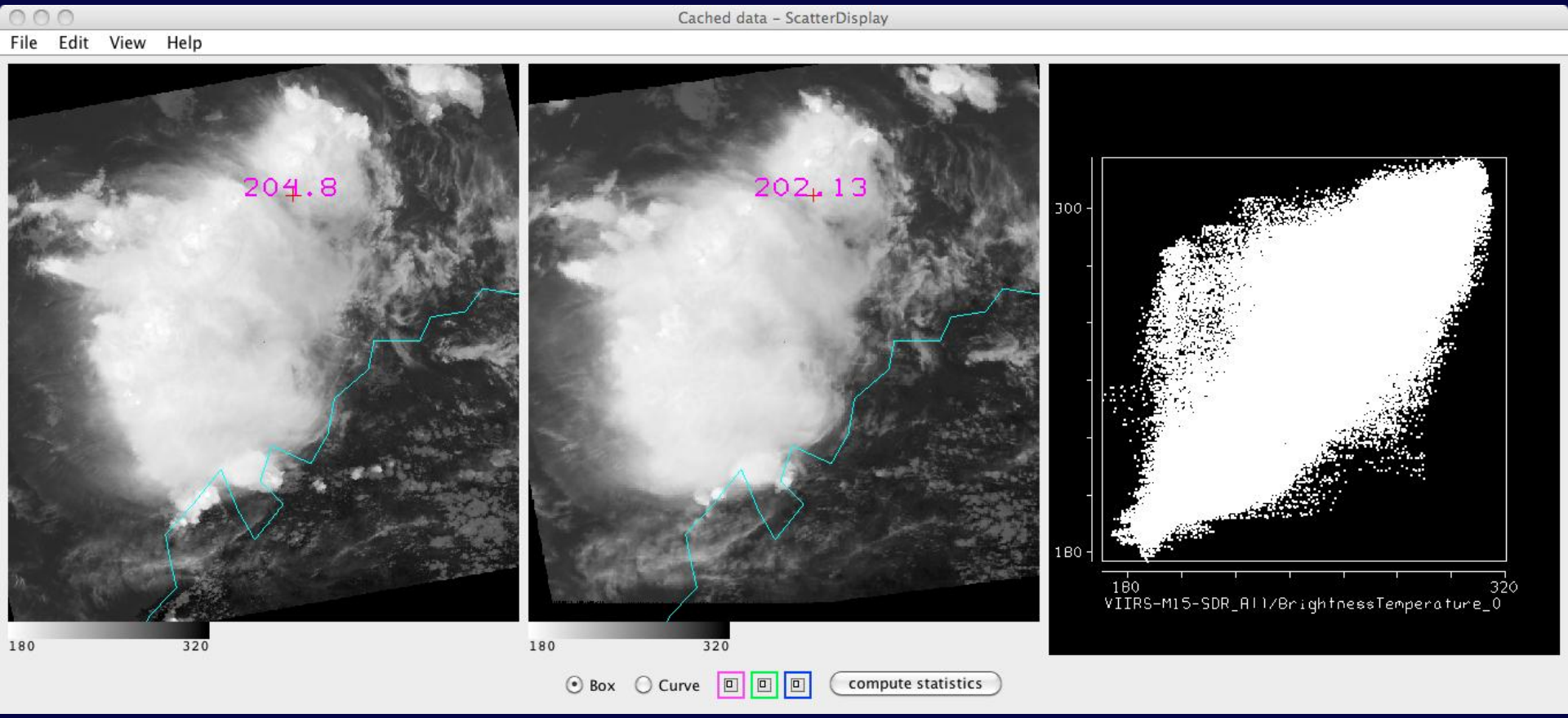
X-Axis: M15

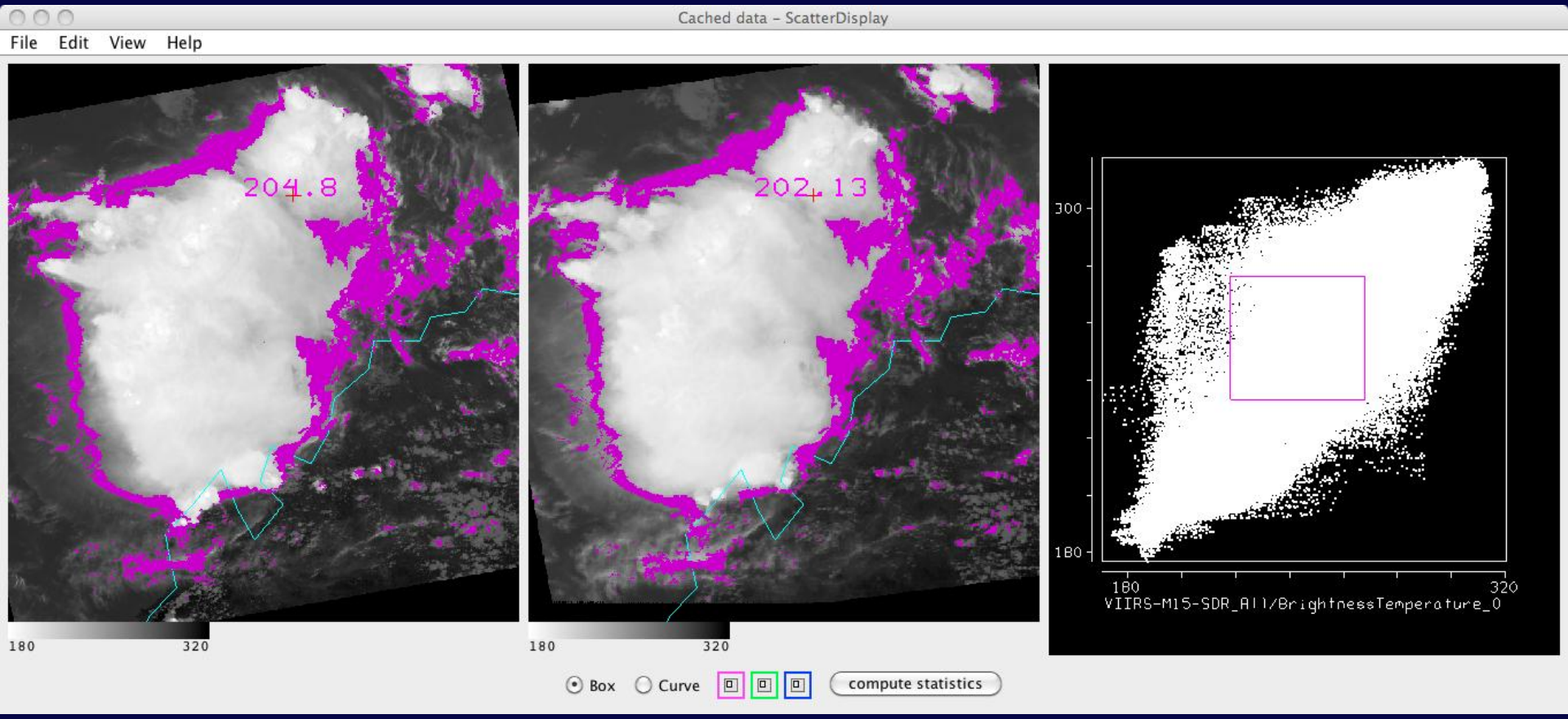
Y-Axis: M14-M15

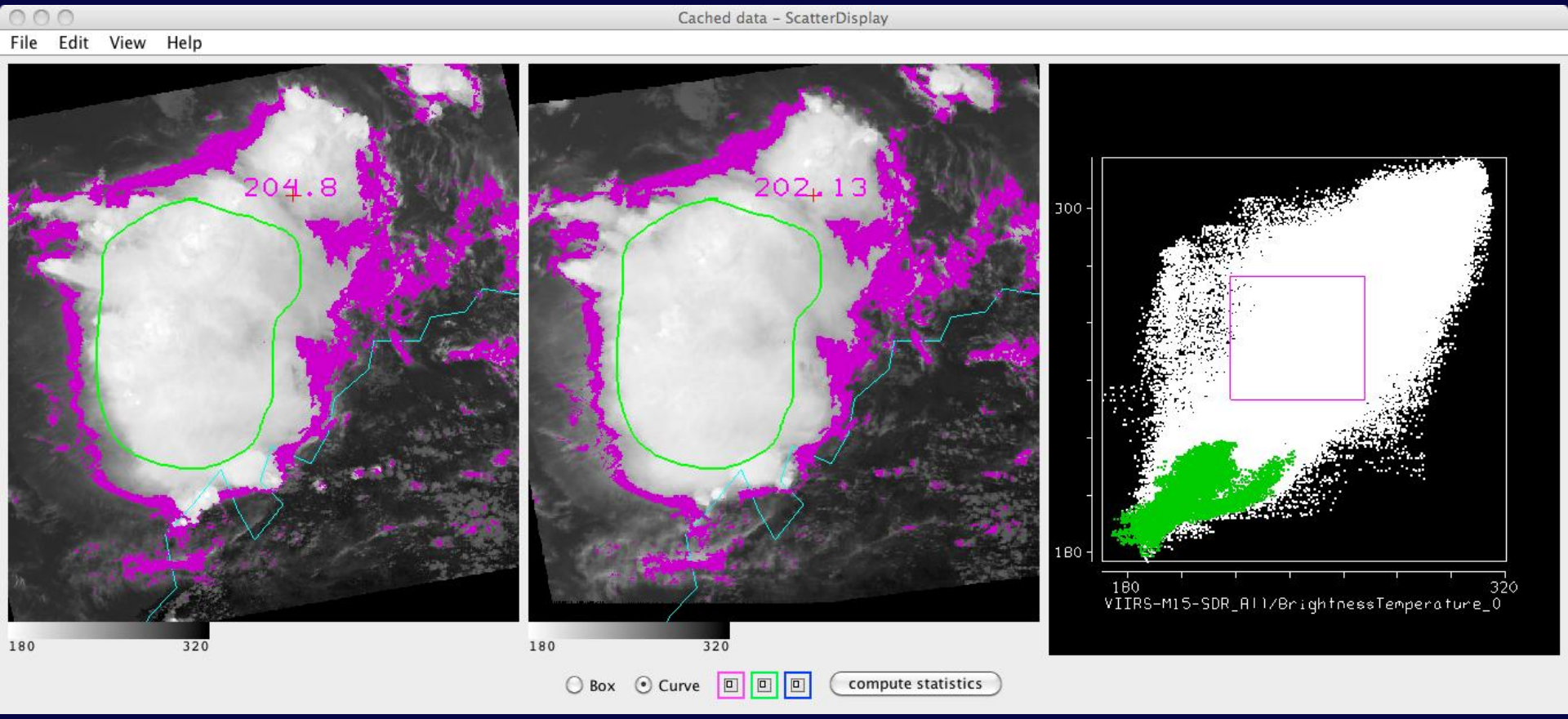

Cached data - ScatterDisplay
File
Edit
View
Help
172.4
308.6
-10
3.5
VIIRS-M15-SDR_All/BrightnessTemperature_3_4
2
-10
180
300
VIIRS-M14-SDR_All/BrightnessTemperature_2
Box
Curve
compute statistics


Cached data - ScatterDisplay
File
Edit
View
Help
172.4
308.6
-10
3.5
VIIRS-M15-SDR_All/BrightnessTemperature_3_4
2
-10
180
300
VIIRS-M14-SDR_All/BrightnessTemperature_2
Box
Curve
compute statistics

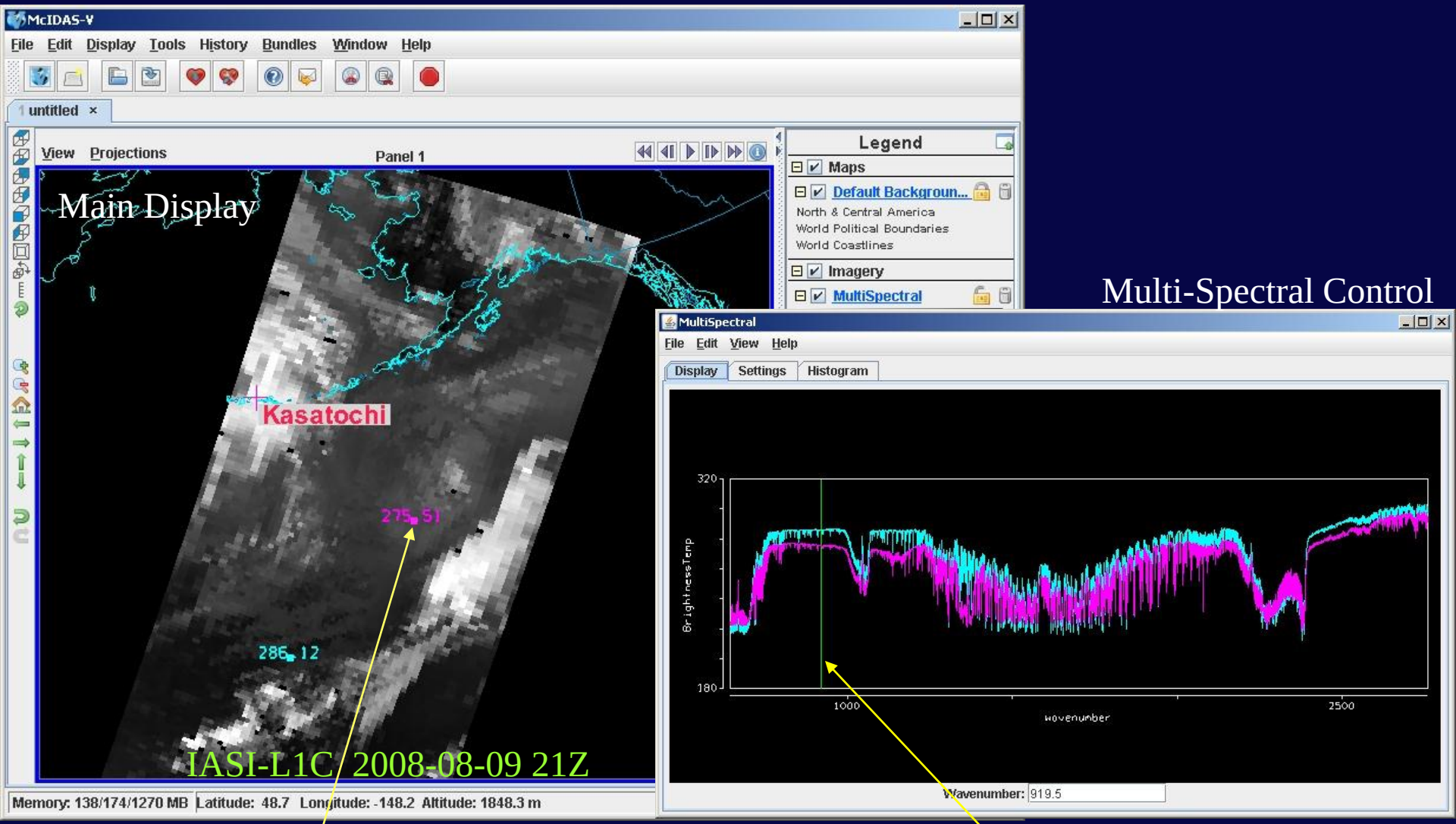
Bi-Directional Interactivity




Cached data - ScatterDisplay
File
Edit
View
Help
204.8
180
320
202.13
180
320
300
180
180
320
VIIRS-M15-SDR_All/BrightnessTemperature_0
Box
Curve
compute statistics


Cached data - ScatterDisplay
File
Edit
View
Help
204.8
202.13
180
320
180
320
300
180
180
320
VIIRS-M15-SDR_All/BrightnessTemperature_0
Box
Curve
compute statistics

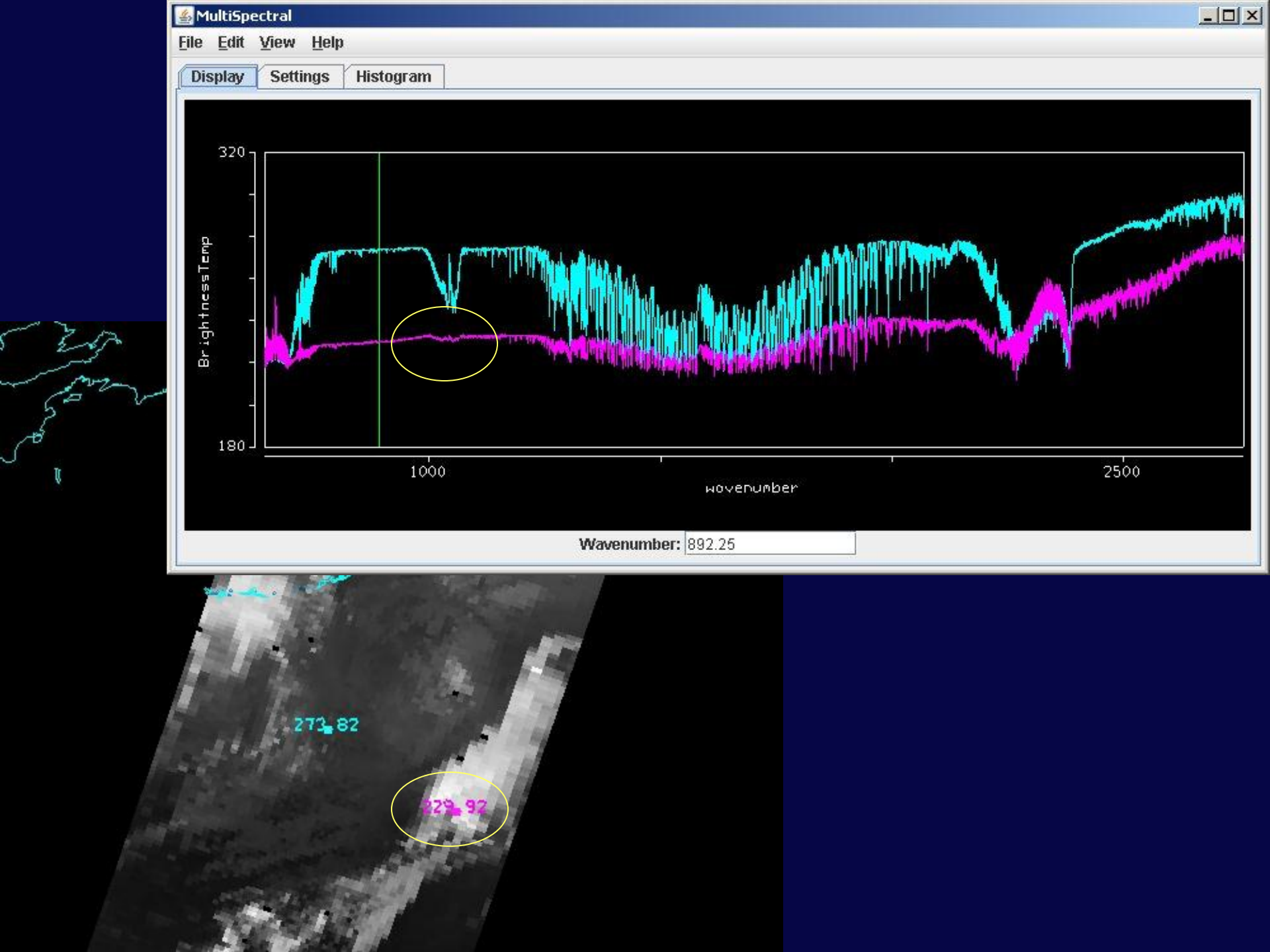
Multi/Hyper-Spectral Interactive Interrogation

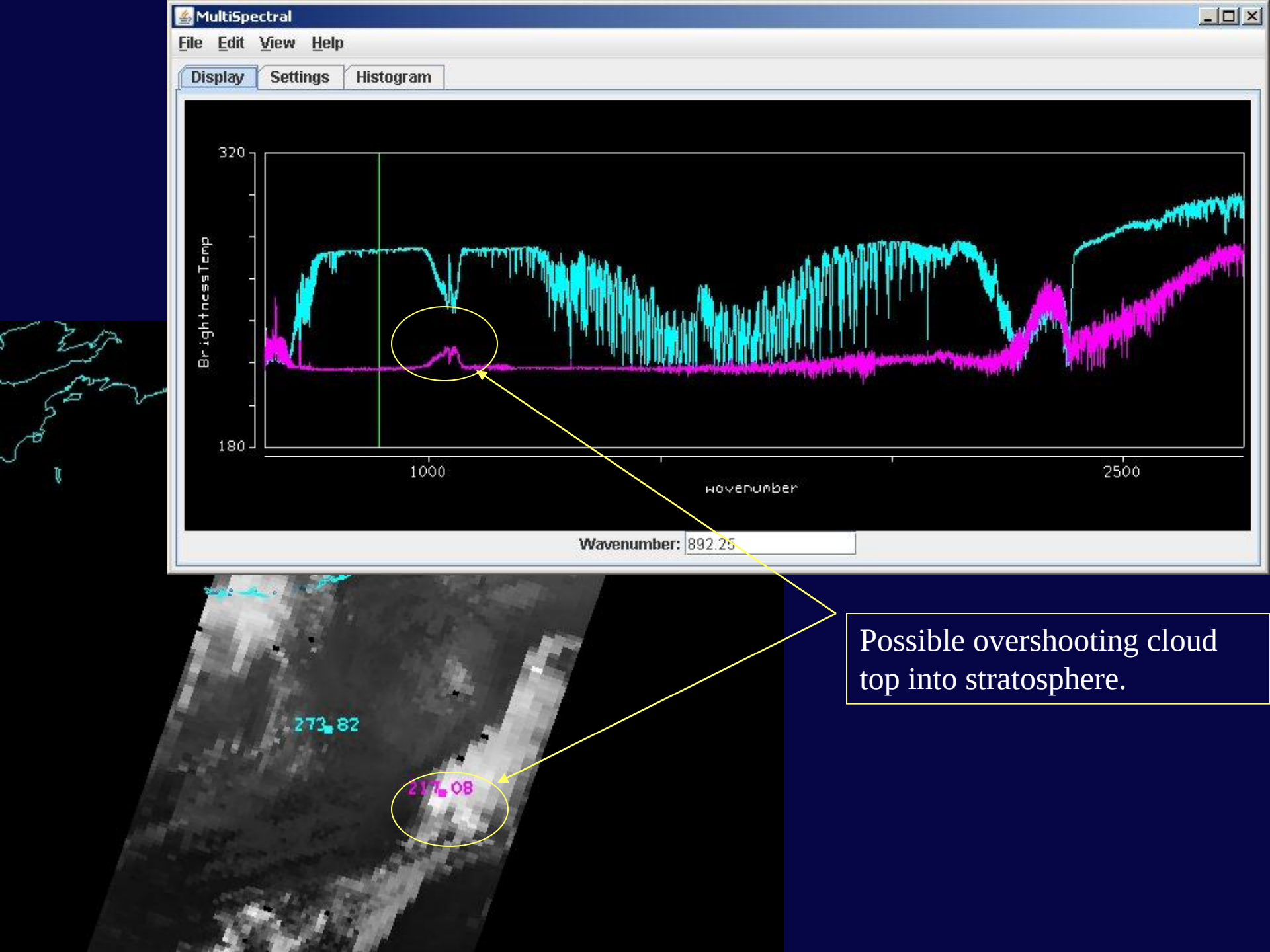


Multi-Spectral Control

Dragging pixel selector/readout probe updates spectra in the Multi-Spectral Control display

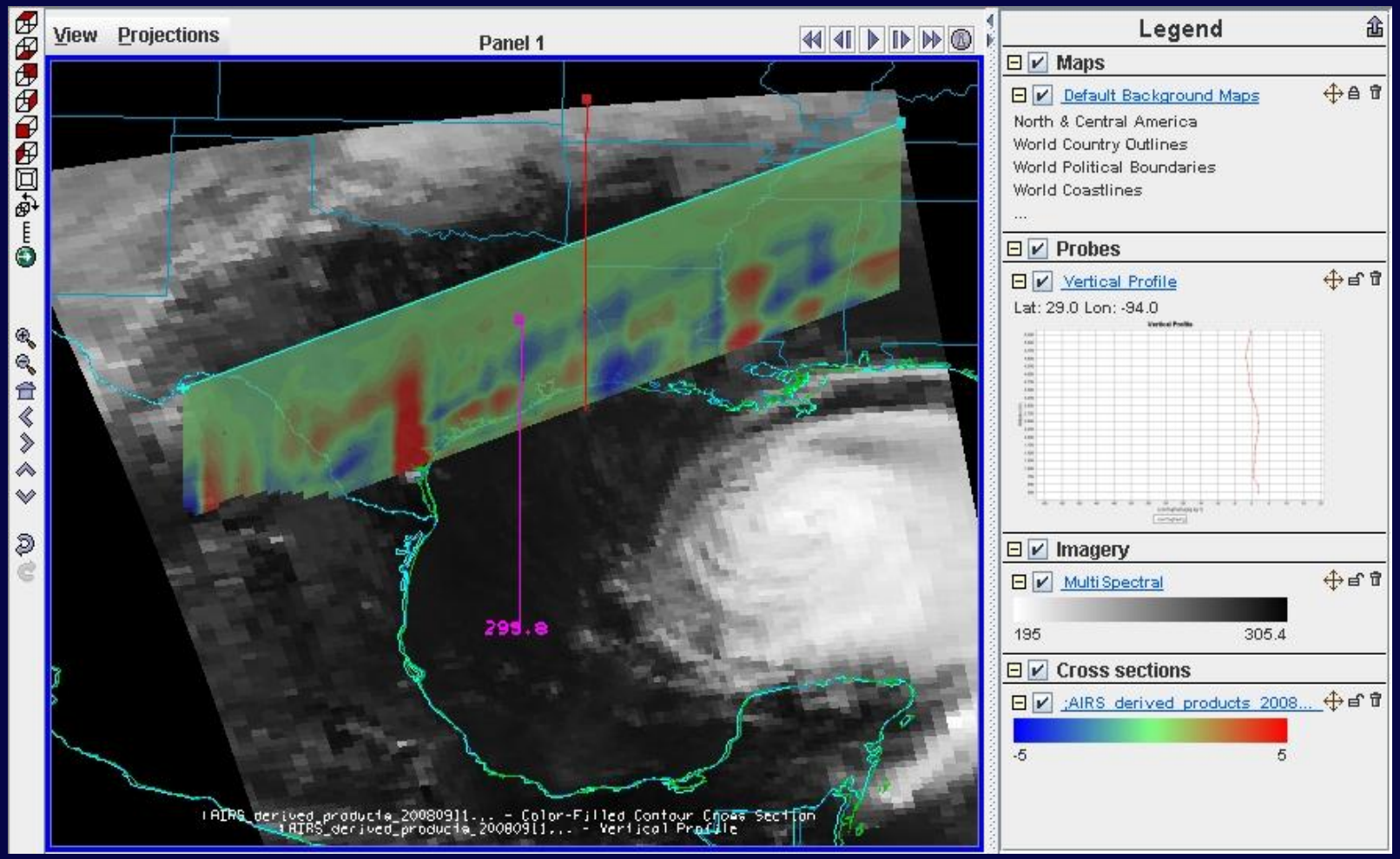
Dragging wavenumber selector automatically updates image in main display


MultiSpectral
File
Edit
View
Help
Display
Settings
Histogram
320
180
BrightnessTemp
1000
2500
wavenumber
Wavenumber:
892.25
273.82
229.92



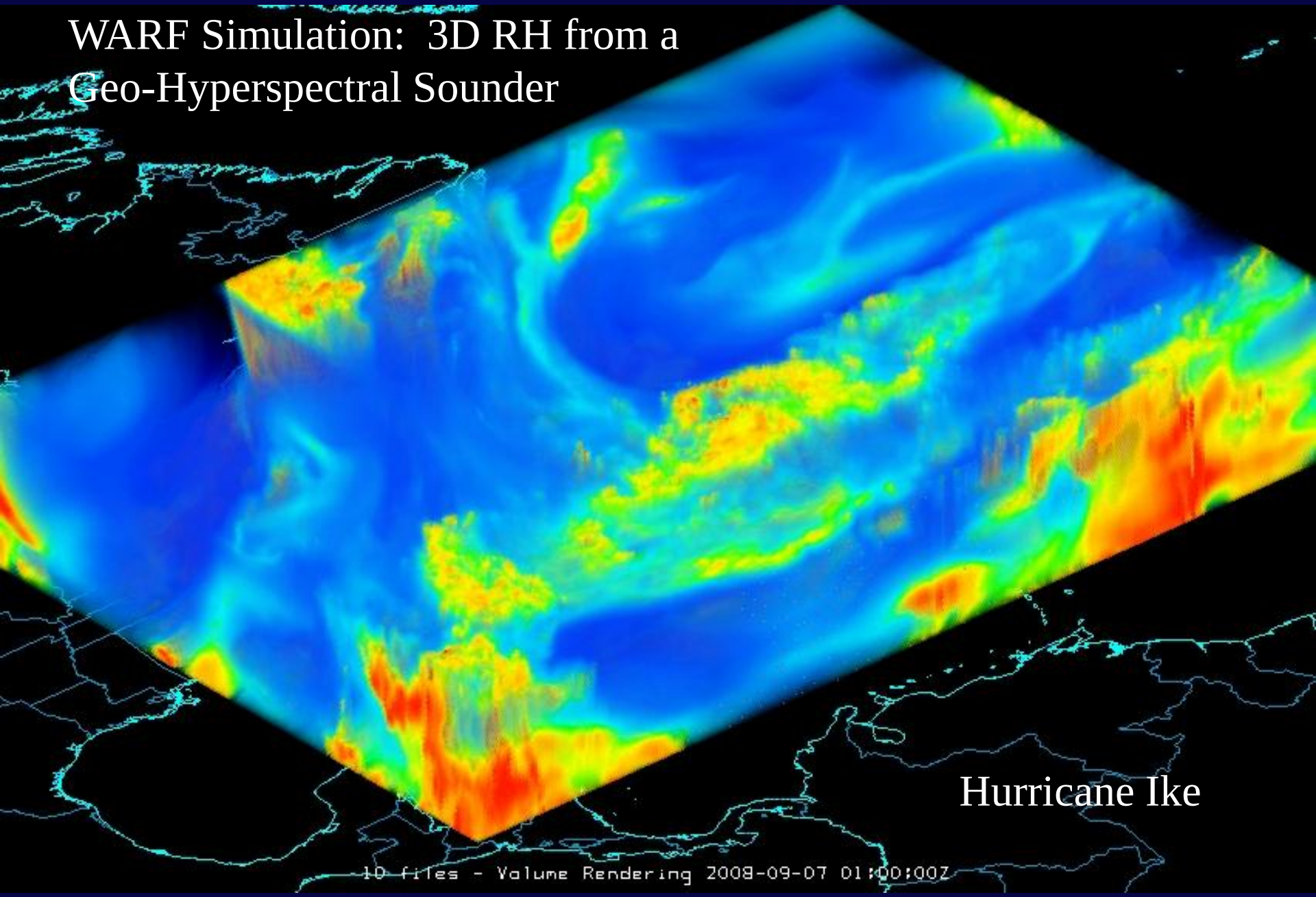
Possible overshooting cloud top into stratosphere.

Advanced Display Capability



AIRS Level 1B window channel image (grey-scale) and moveable 2-D slice of ECMWF-AIRS Single FOV water-vapor retrieval (color-scale). Slice values are re-sampled on the fly from the 3-D difference field and auto-updated as the slice is dragged in space - demonstrating interactive direct manipulation, data integration and python driven data computation.

Advanced 4D Visualization



McIDAS-V software

- Is freely available, open source software
- Easy to install on most operating systems
- Great learning tools available
- Excellent user support from MUG
- Operates on numerous data types
- Powerful analysis tools

McIDAS-V software

McIDAS-V is free, open source software

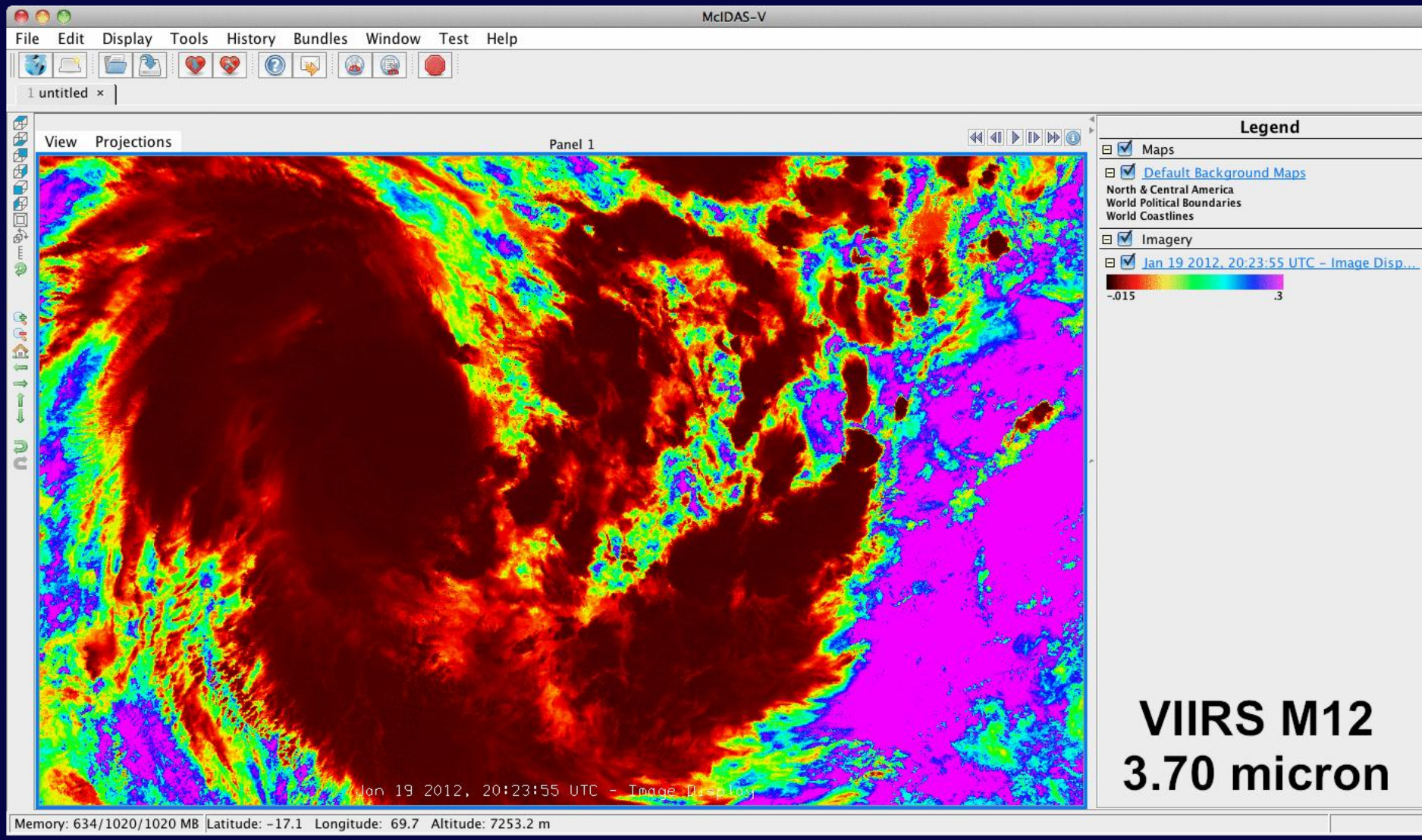
available at

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

or

google – mcidas

McIDAS-V Suomi NPP Ready



Courtesy: Tommy Jasmin, SSEC/CIMSS