McIDAS:
The First True GIS Mashup

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UW / CIMSS / SSEC
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Except GIS means many things

So let's assume we mean "geospatial data"

Geospatial Data:

- Data with "when" and "where"
- Must be able to find and retrieve that data
- Must be able to visualize and analyze that data

Turning Earth-located data into useful information

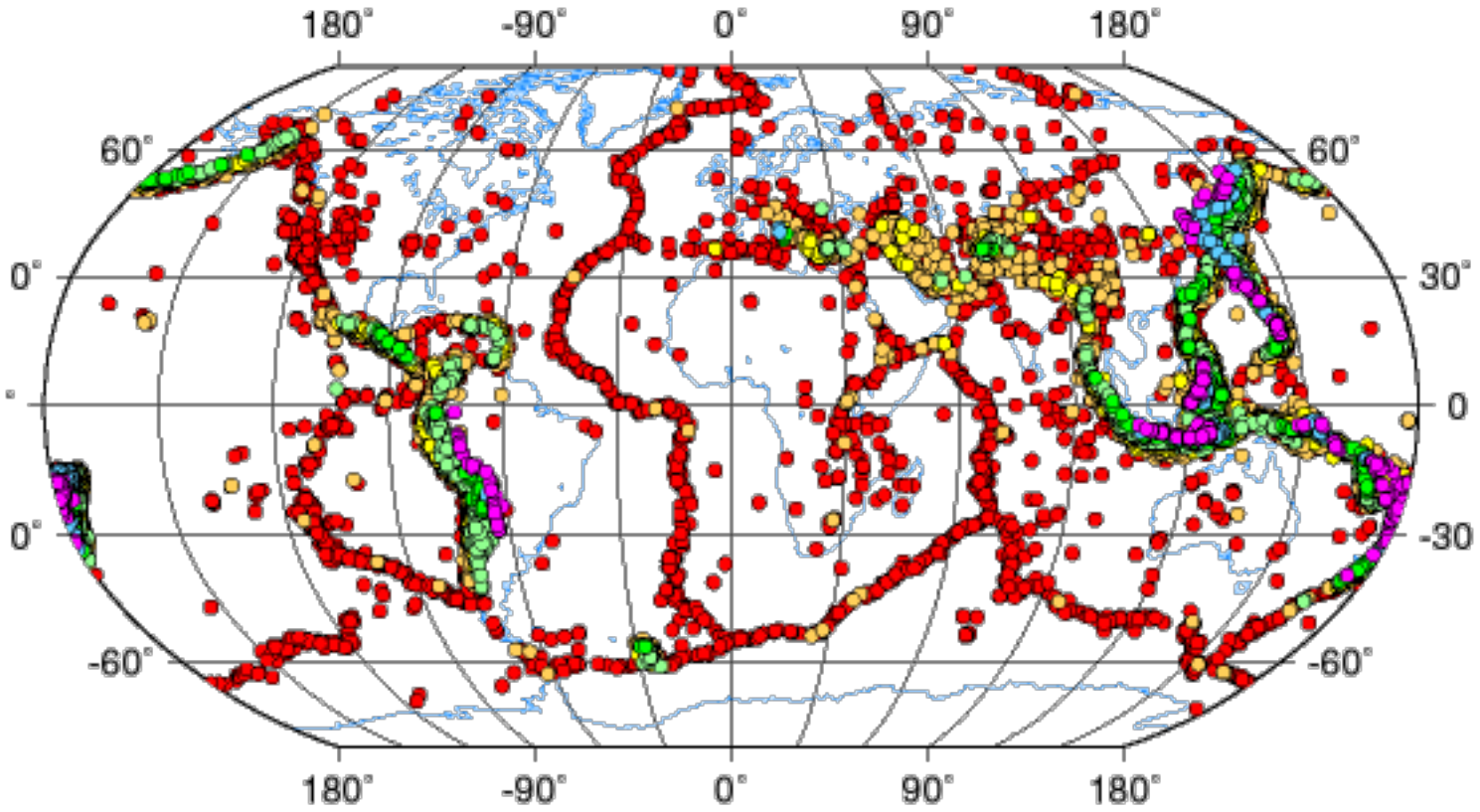
Mashup Defined

Originally, pertained to music (circa early 1990s)

Wikipedia: A song or composition created by blending two or more pre-recorded songs, usually by overlaying the vocal track of one song seamlessly over the instrumental track of another.

In a GIS context: The process of combining multiple sources of data into one integrated spatial display **to create something that none of the individual data sources could provide on their own**.

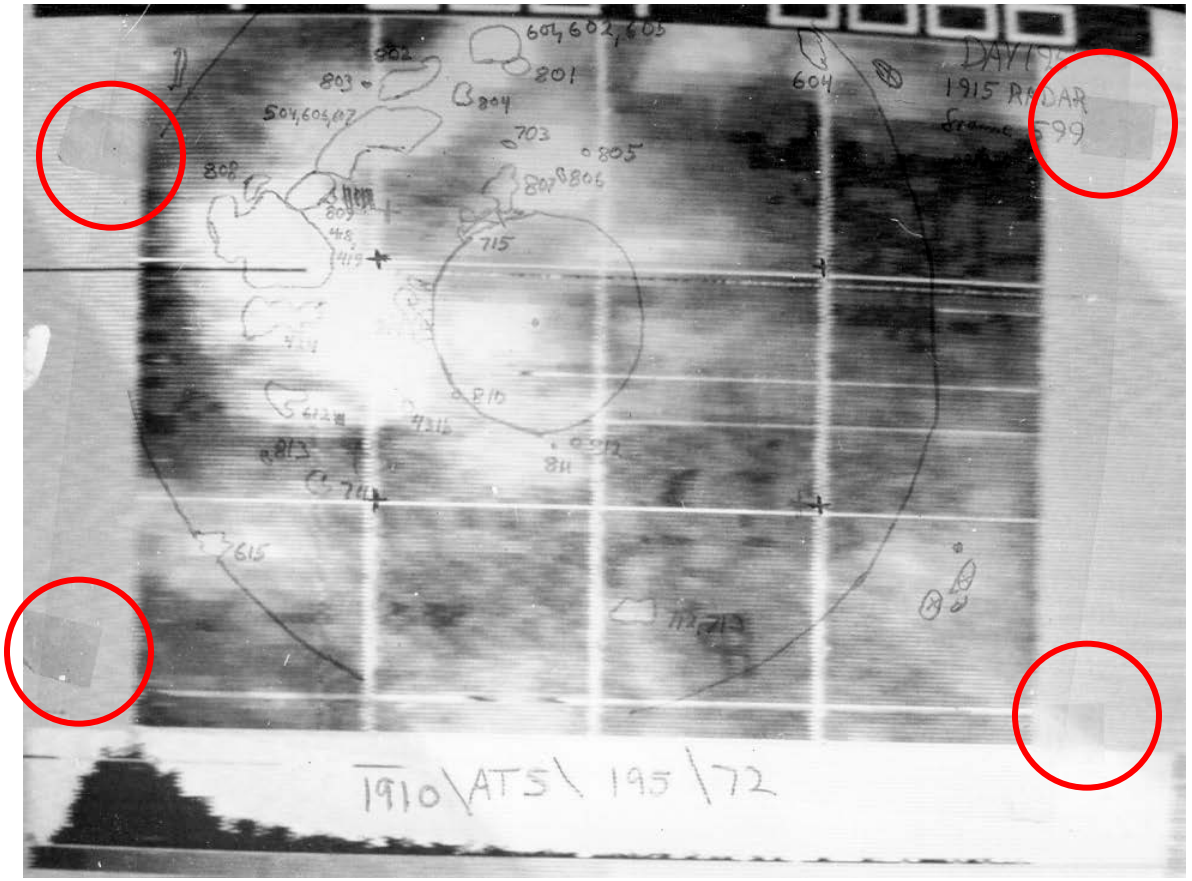
Considered a very early GIS mashup



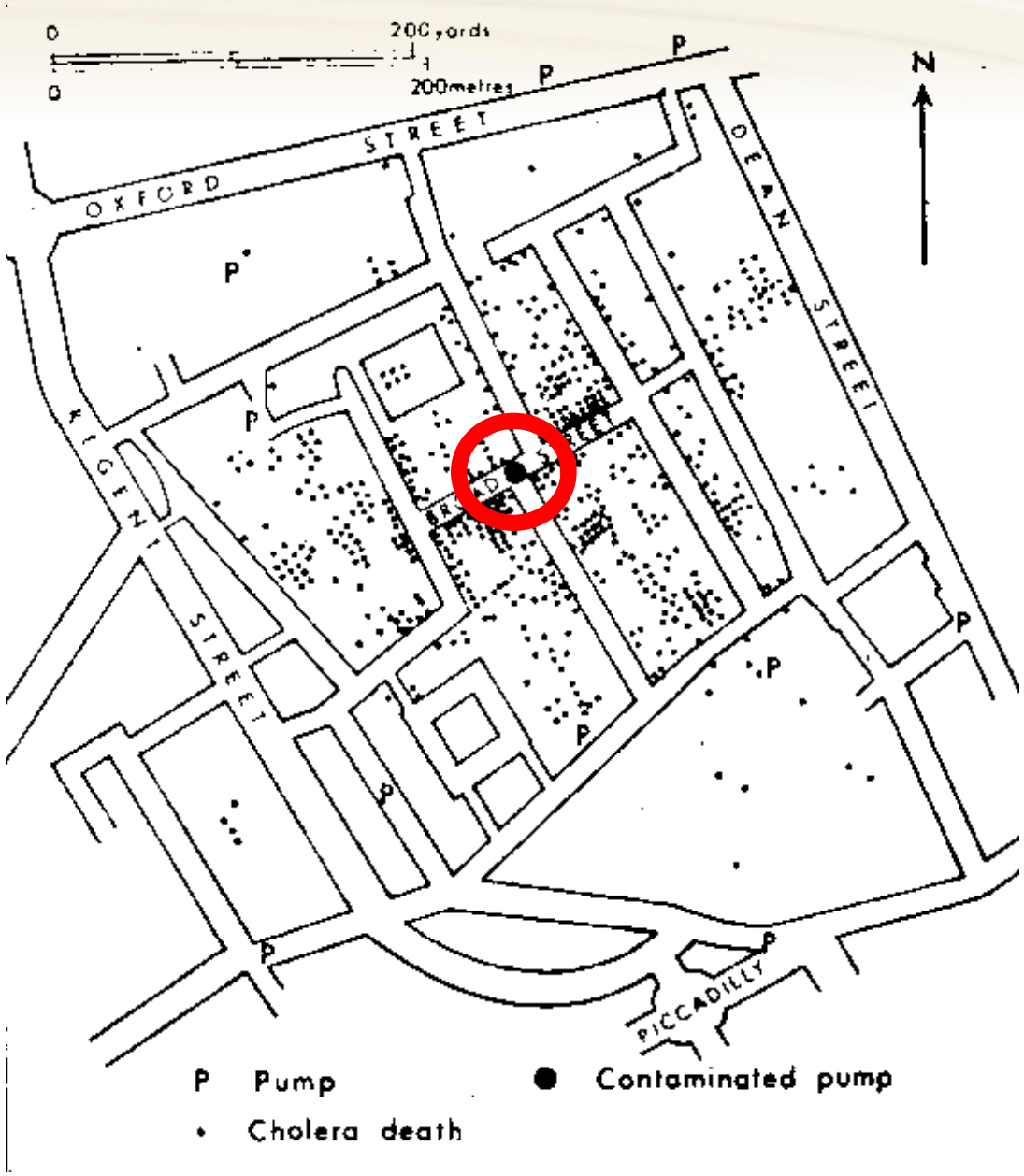
1995: World Wide Earthquake Locator

1. **Used Xerox PARC mapping system**
2. **Provided real-time earthquake data with tectonic plate boundaries**

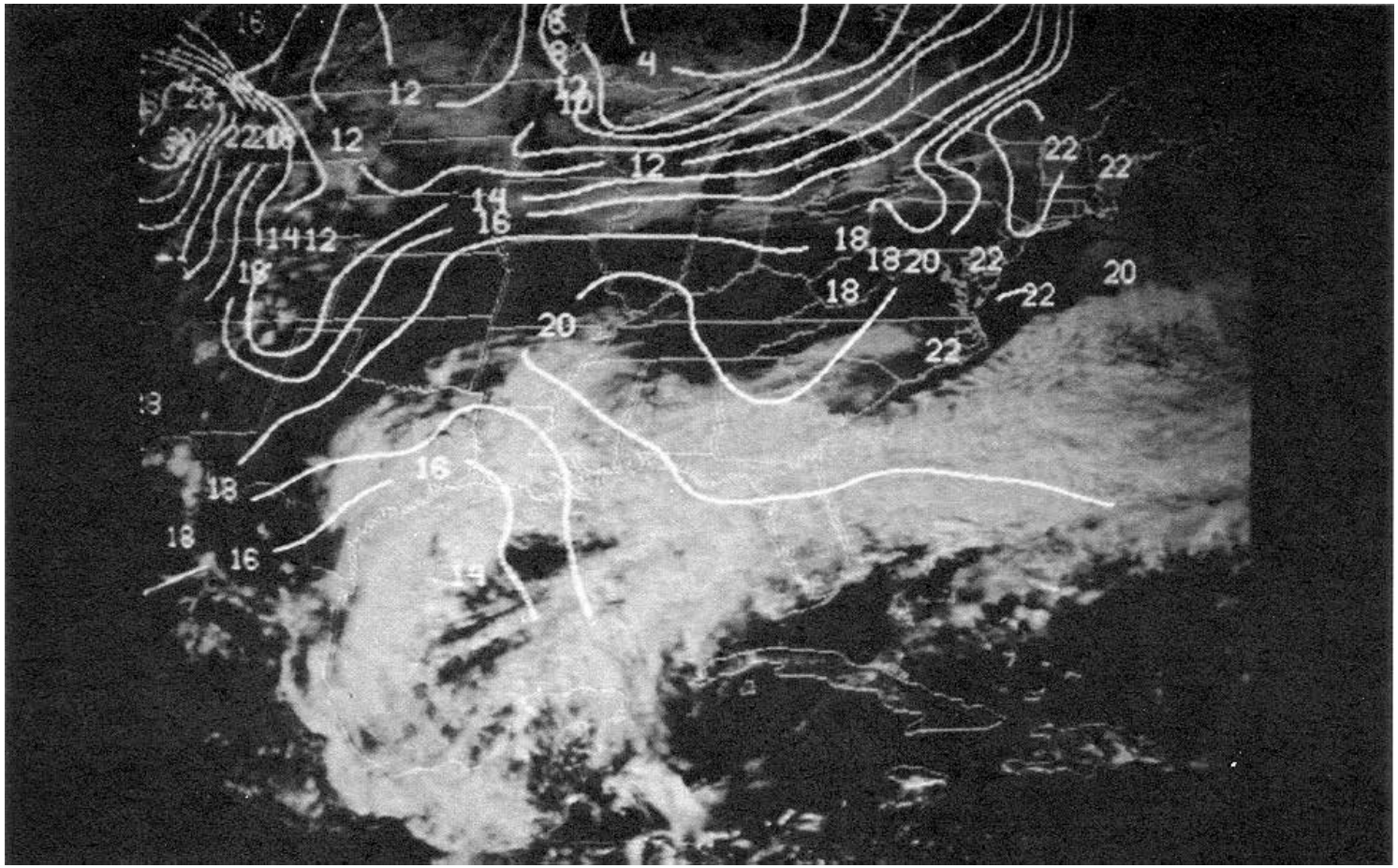
Well wait a minute…



Dr. John Snow cholera map, London, 1854

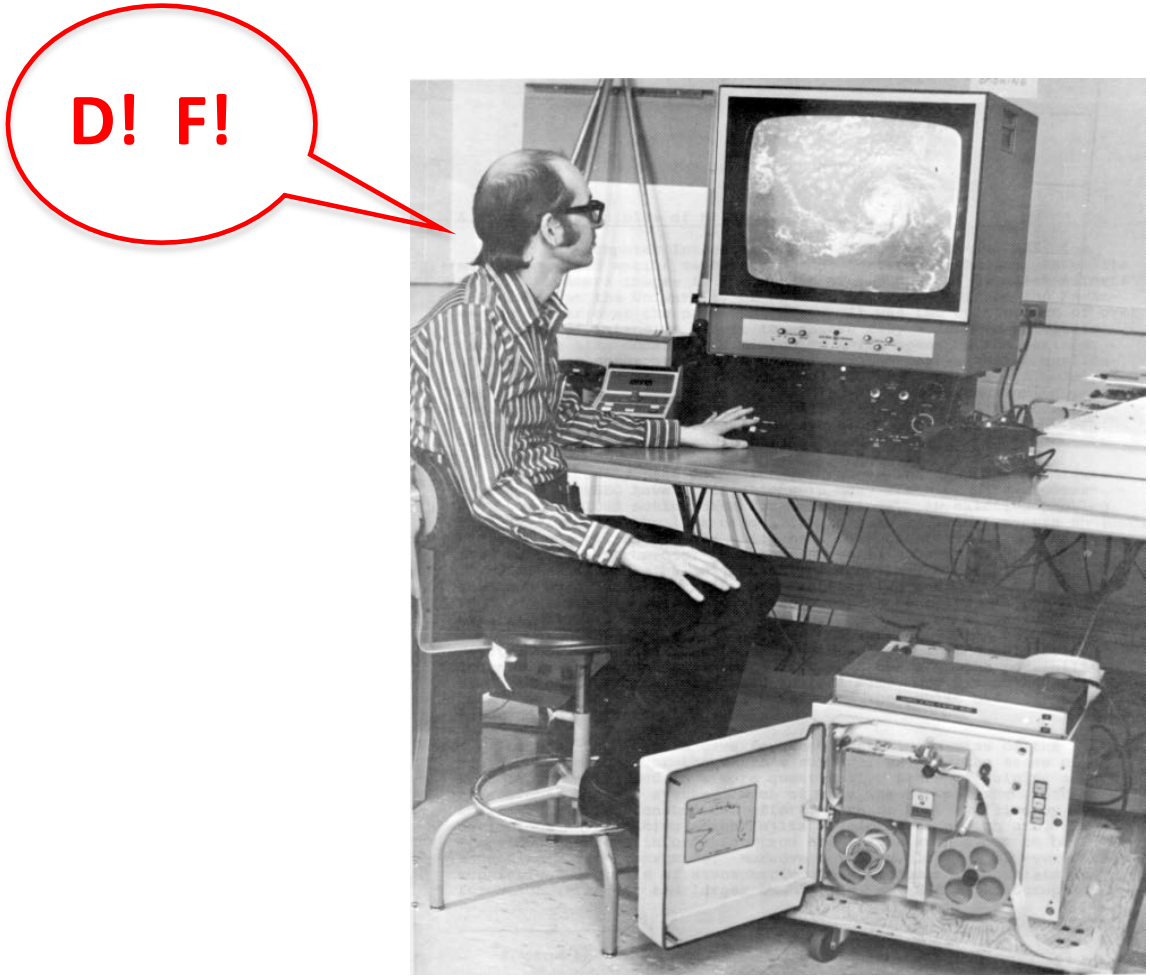


A True Historical Mashup in McIDAS

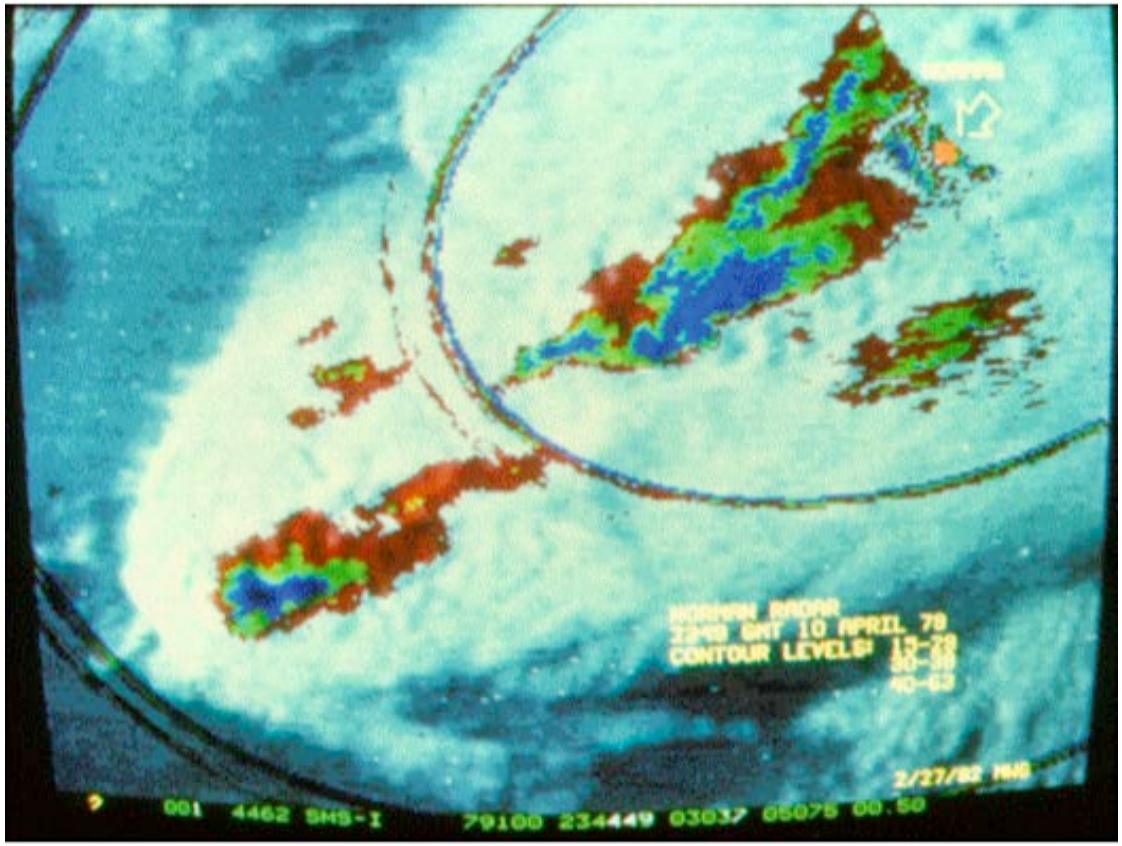


Satellite image with temperature contours

McIDAS Prototype (Windco)

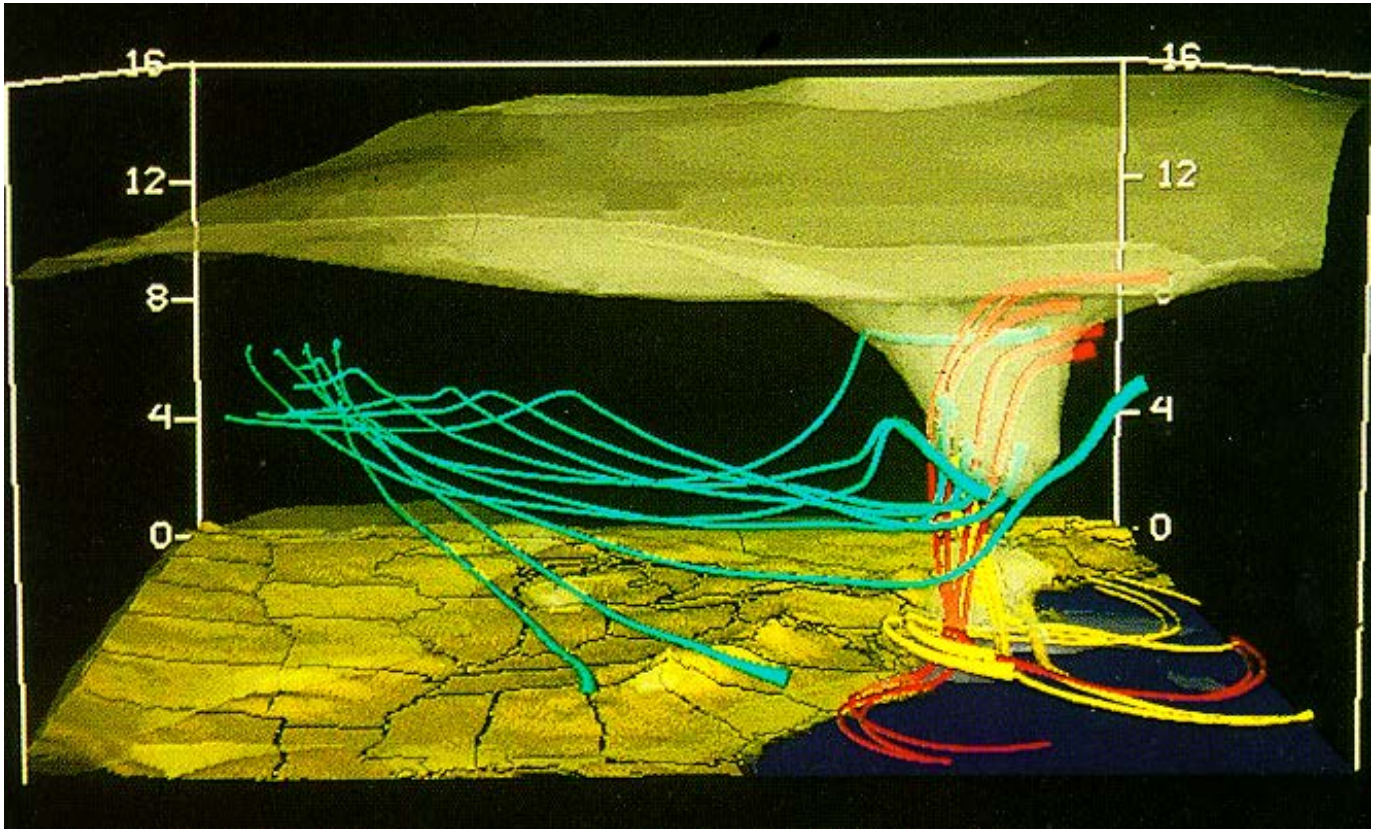


Another early McIDAS Mashup



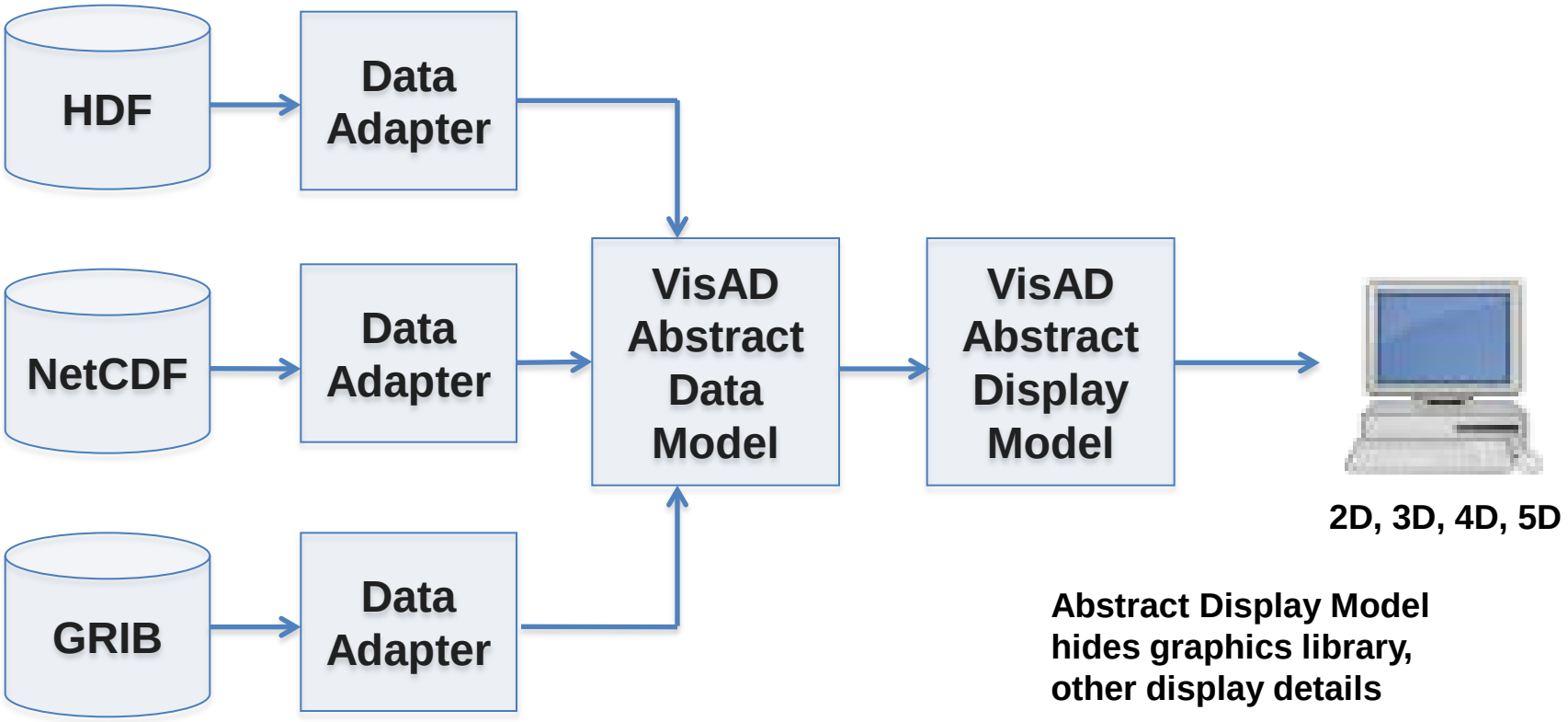
Satellite image with radar data overlay

And then came Dimensions 3 and 4

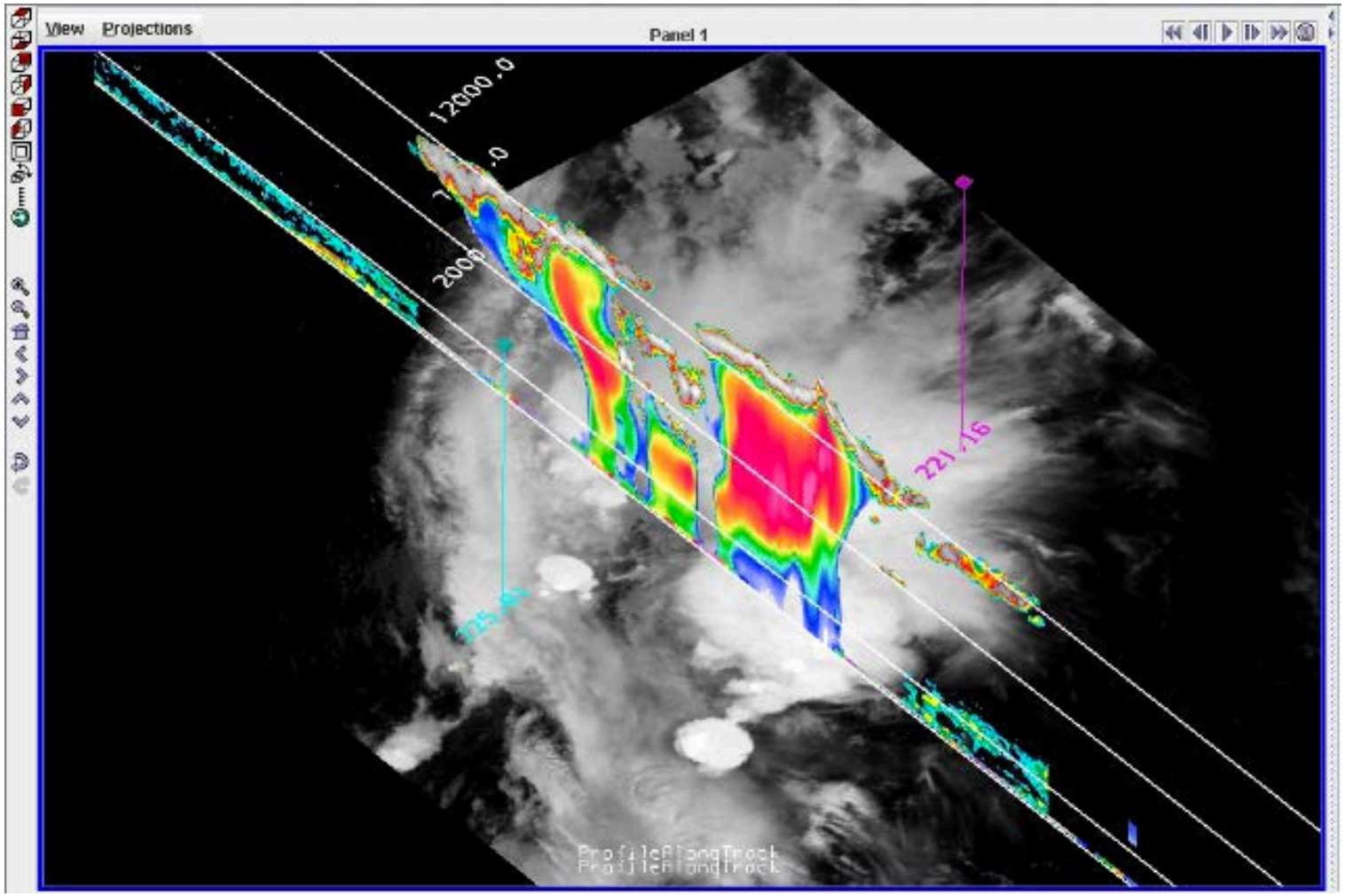


4D Visualization of Presidents' Day Storm, 19 Feb 1979

VisAD gave us interoperability, 3D, 4D, 5D



Satellite, Lidar, and Radar Data Together



CALIPSO Lidar, CloudSat Radar, and MODIS Infrared Satellite data
Credit: Kris Bedka, NASA Langley

Why is interoperability so important?

1. The current accumulation rate of geospatial data

We have accumulated more geospatial data in the last 10 years than in **all of history**.

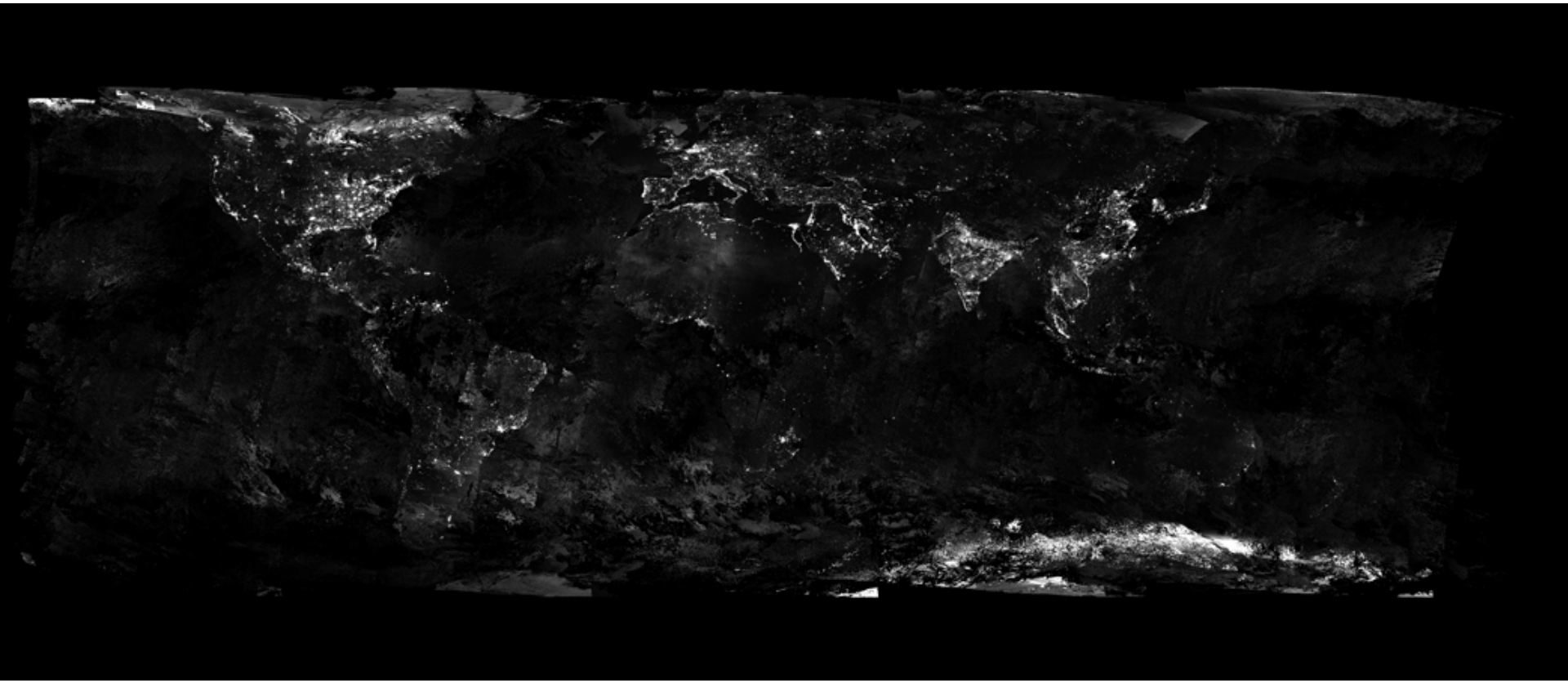
Most of us are now walking consumers **and** producers of geospatial data

Think sampling rates (e.g. flux measurements, lidar)

1 sub-meter full Earth satellite image = 1 PB

Why is interoperability so important?

2. Creation and distribution of geo data is becoming much easier

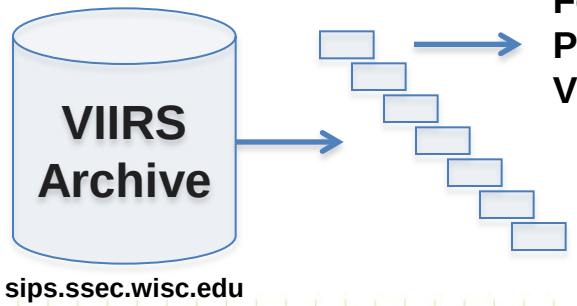


VIIRS DNB Global Composite generated entirely from April 2015 data

1. **At present, 0.1 degree spatial resolution (much lower than best possible)**
2. **Many false positives from auroras and moon illumination**

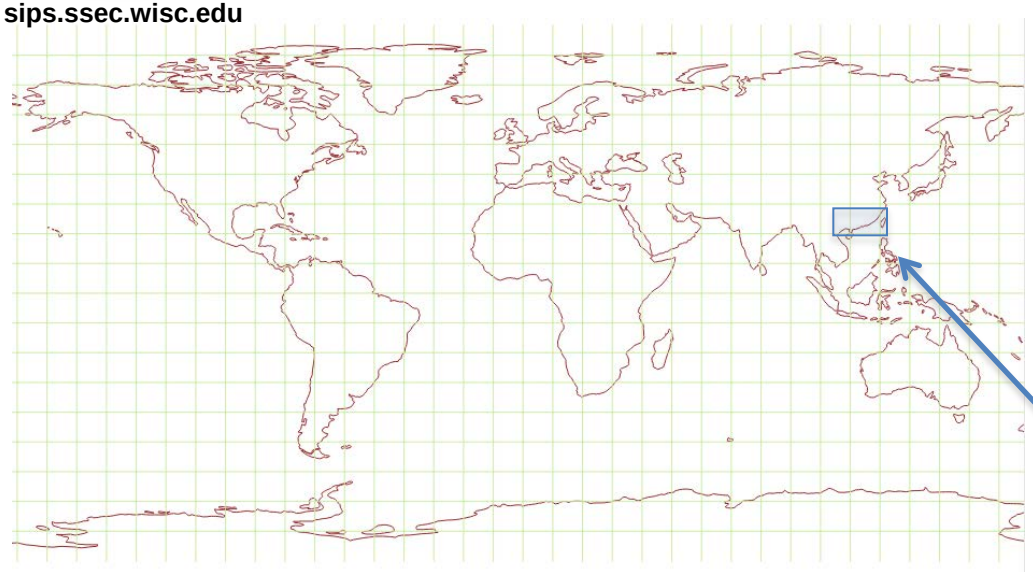
A framework for automatic VIIRS image compositing

Study Period: April 1 - April 30 2015 (~1.3 TB)
For each 12 hour period, fetch all nighttime DNB granules, and VIIRS CM granules. Process, delete, repeat. ~45 GB / day, ~2,200 files

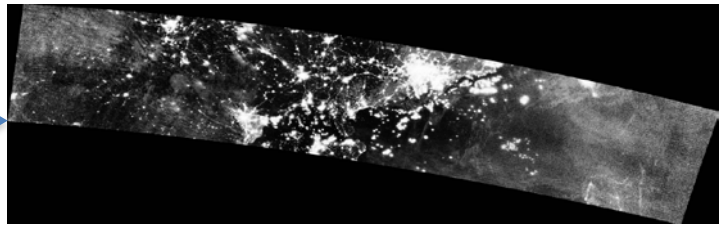


sips.ssec.wisc.edu

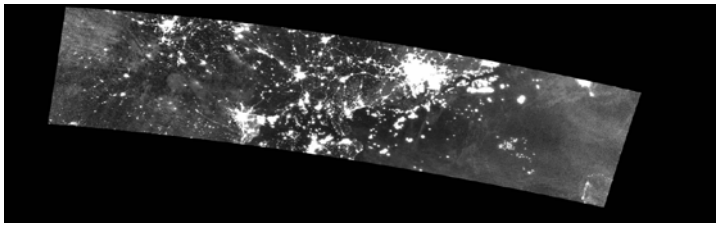
For each granule,
Process (Polar2Grid)
View if needed (McIDAS-V)



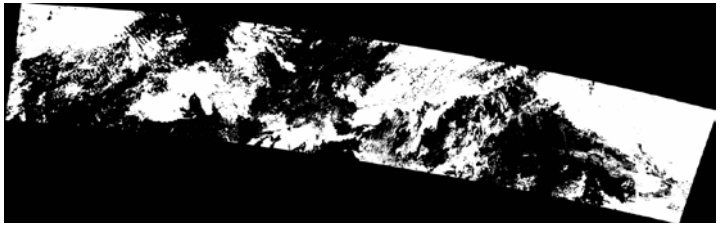
Completely automated, in a single extensible script!



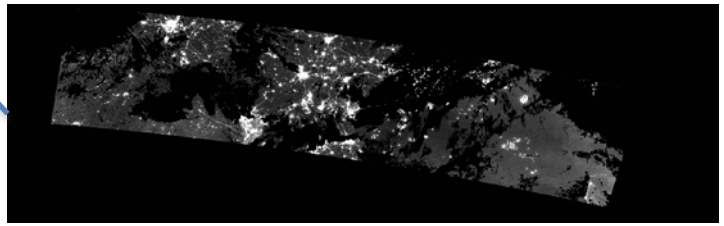
Full granule



Clip each edge of swath

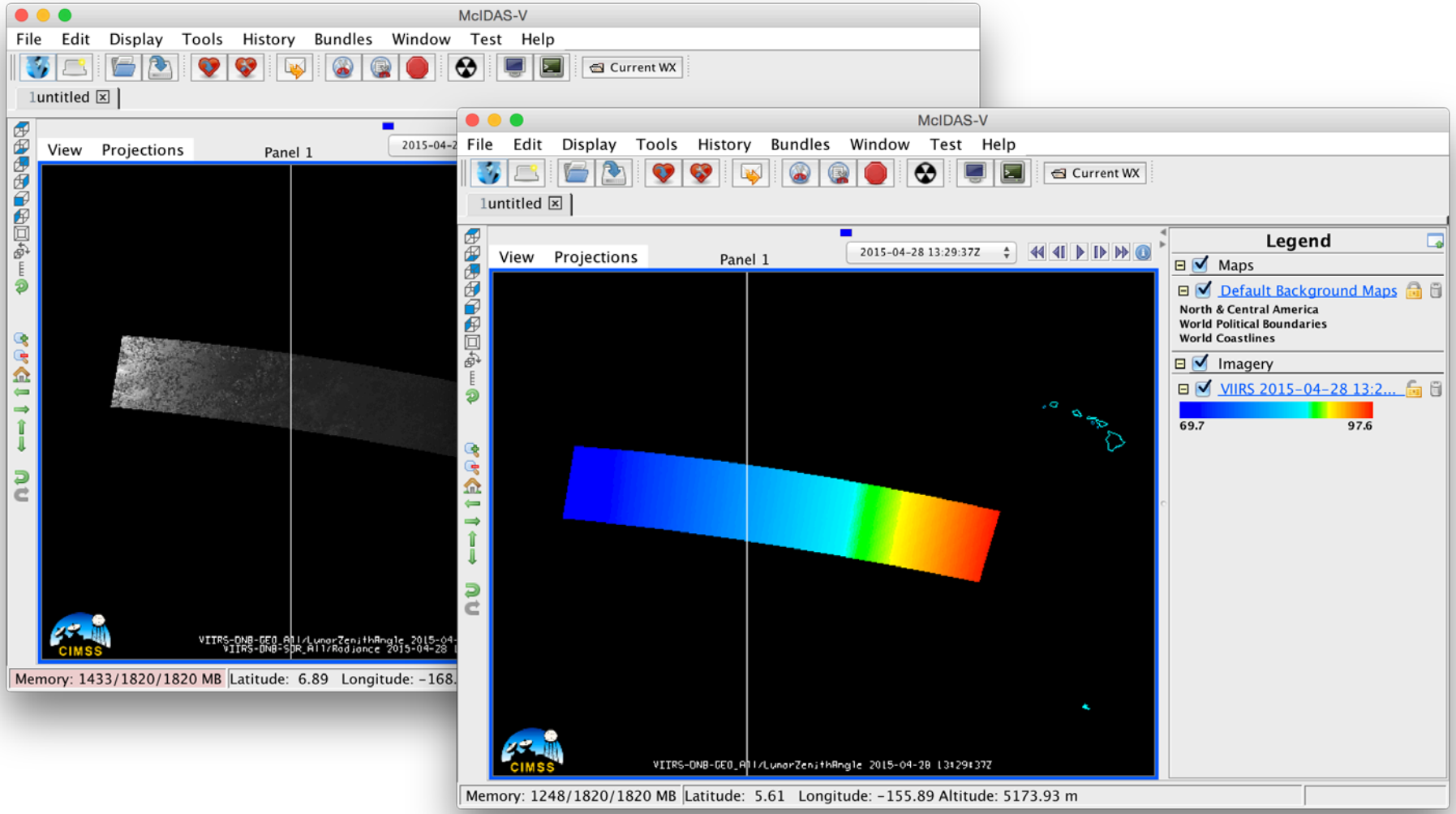


Generate cloud mask

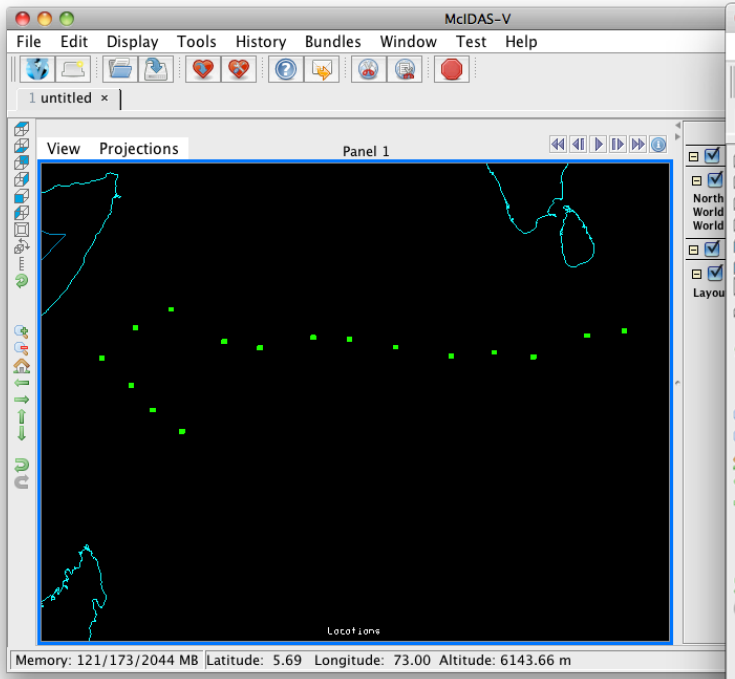


Data passed on to final product

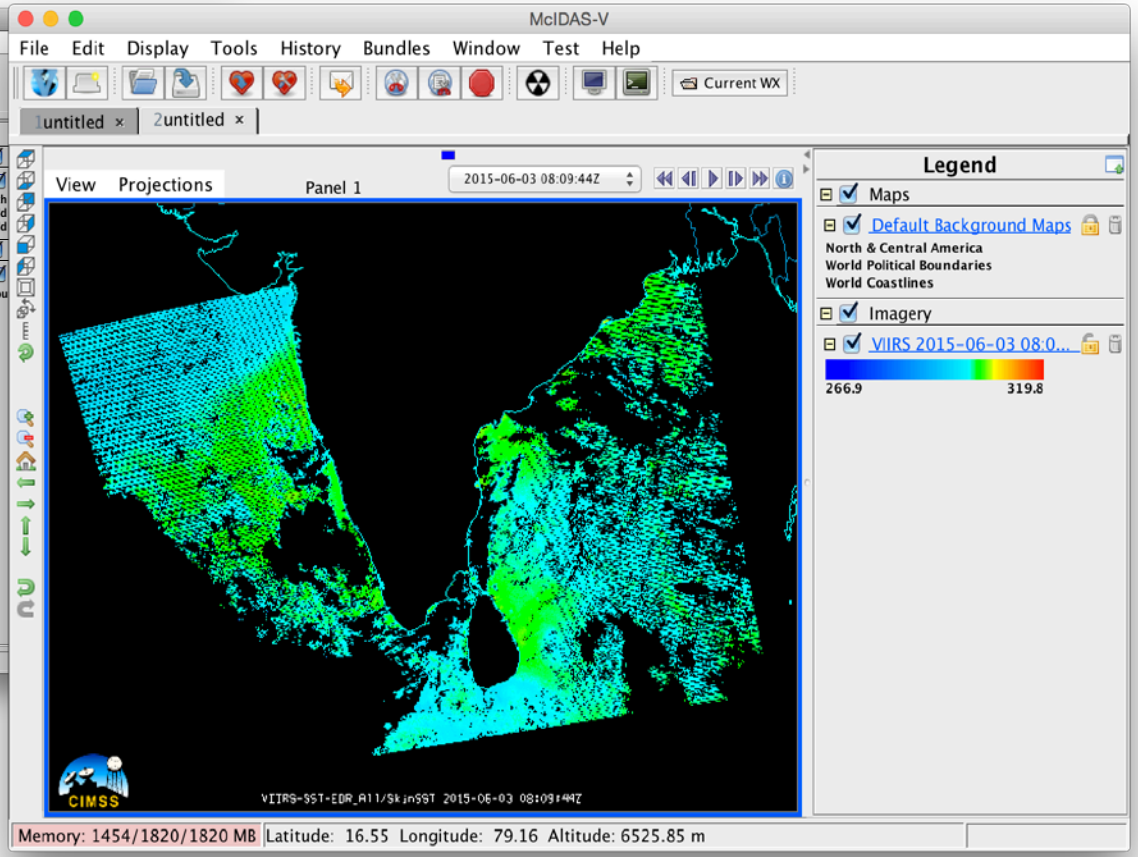
Using McV to tune DNB algorithm



Ex 1) Why not mash this up?

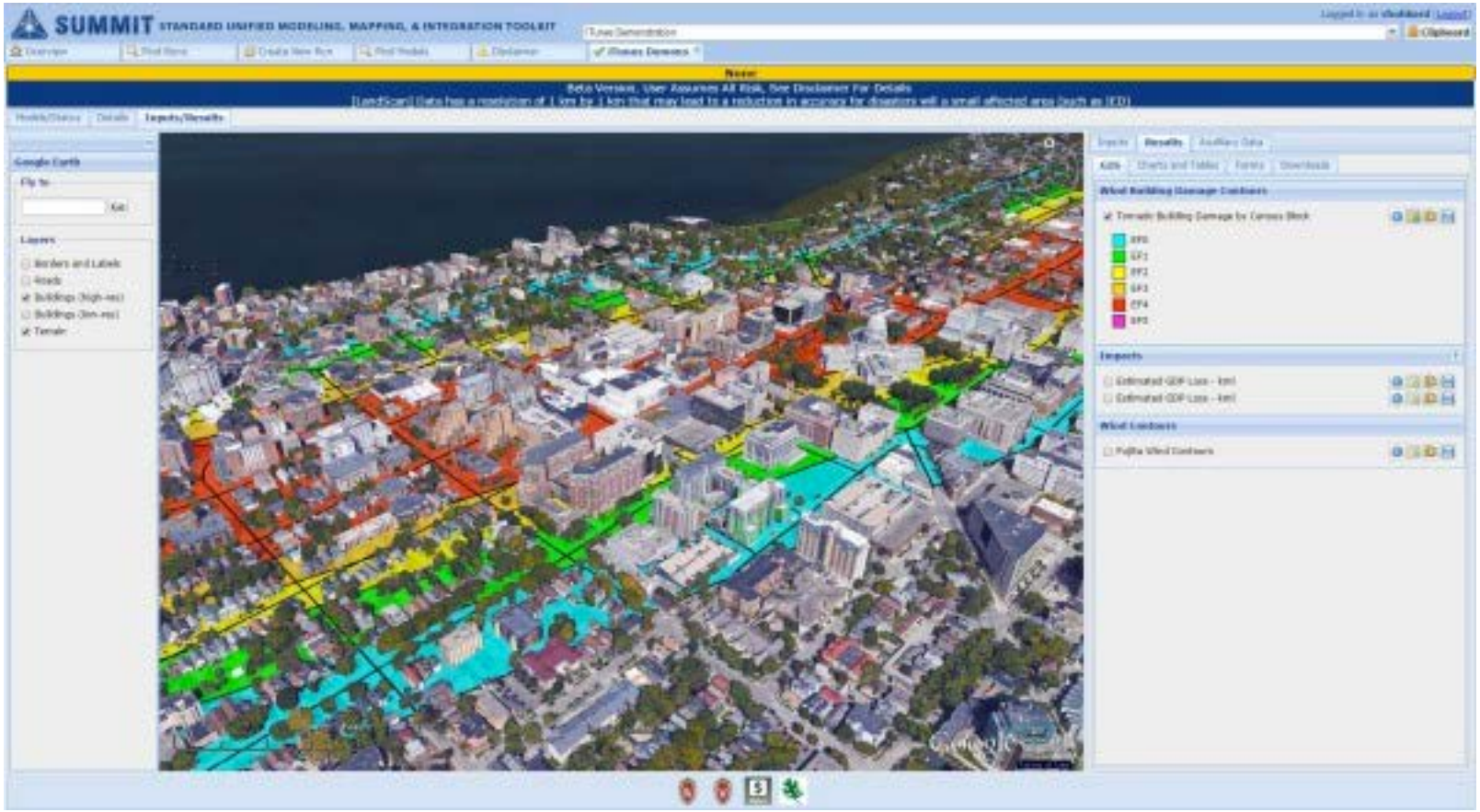


Whale Shark migration route from KML file



Random VIIRS SST granule

Ex 2) Why not mash this up?



What if we intersect a tornado track with US Census Data?

Going forward

SOA: Service Oriented Architecture
The notion that any computer application can be broken down into components, many of them provided by services distributed on the Internet

```
sunshine:~ tommyj$ cat /etc/services | grep mcidas
mcidas          112/udp    # McIDAS Data Transmission Protocol
mcidas          112/tcp    # McIDAS Data Transmission Protocol
```

For SOA to work:

1. Need standards, so systems can be interoperable
2. Need easy way to search for services that meet specific requirements

OGC: Open Geospatial Consortium

- WMS: Geo-referenced map image layers (what RealEarth uses)
- WFS: Vector data, e.g. map outlines (disputed areas, reefs, etc.)
- WCPS: Similar to ADDE, sensor data with processing and **standards**

An Obligation to Collaborate