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Environment and Climate Change Canada Satellite Network and Use of CSPP Tools

Ron Goodson

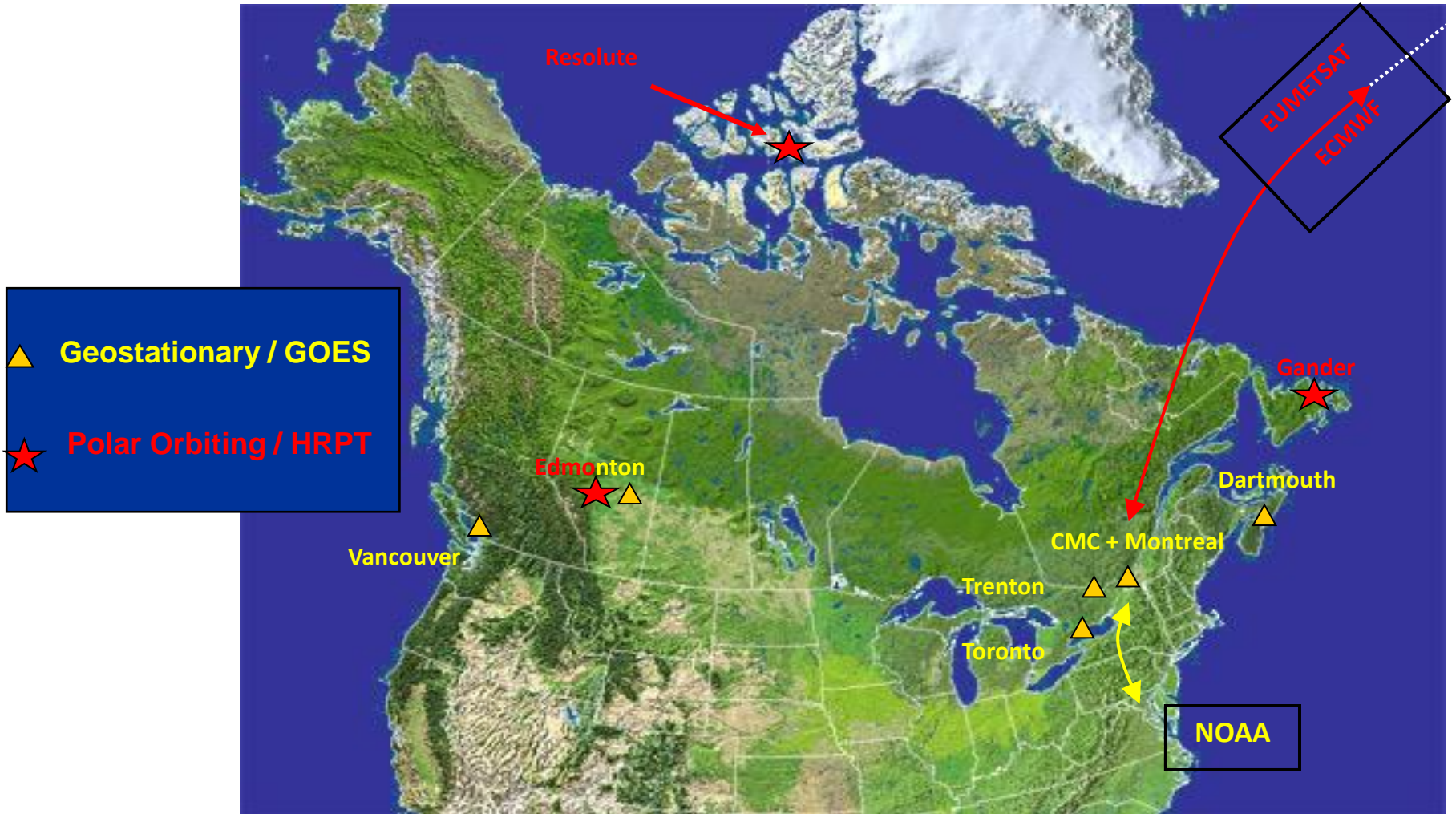
Yufei Zhu

Dave Bradley

Presented By: Ron Goodson

Canada 

MSC Space Based Monitoring Network



Polar Orbiting (HRPT) Network

- HRPT Stations in Gander, Edmonton (x2), Resolute receive data broadcast from polar orbiting satellites
- **Satellites Tracked**
 - NOAA POES: NOAA-15, 18, 19,
 - EUMETSAT METOP-A, B
 - MODIS on Tera & Aqua,
 - VIIRS on S-NPP
- **Ground Station Infrastructure**
 - 2.4 m L-X Band tracking antenna inside a radome
 - Reception electronics and product generation from SeaSpace Corp.
 - ~ 98% of planned acquisitions are successful



GOES Network

- Receives data broadcast from NOAA's Geostationary Operational Environmental Satellites (GOES)
 - Imager and sounder radiances
 - Downlink data rate 2.11 Mbps
- 7 GOES-E, 4 GOES-W stations
 - Regional products
 - CMC national products and backup
- Ground Station Infrastructure
 - 5.0 m fixed-direction antennas



Satellite Images and Animation
Satellites (All satellite data courtesy of NOAA)

GOES Composites | GOES-East | GOES-West | HSP1

GOES-DC 2017-04-27 14:15 UTC IR

GOES-East/West

North American Composite *

- [IR & Isocontours](#)
- [WVIR \(1.6µm\)](#)
- [Visible & Isocontours](#)
- [IR + Visible](#)

Weather

- [Canada](#)
- [Public](#)
- [Radio](#)
- [Satellite](#)
- [Severe](#)
- [Air Ops](#)
- [Marine](#)
- [Water](#)

Animation
Animation
Animation
Animation



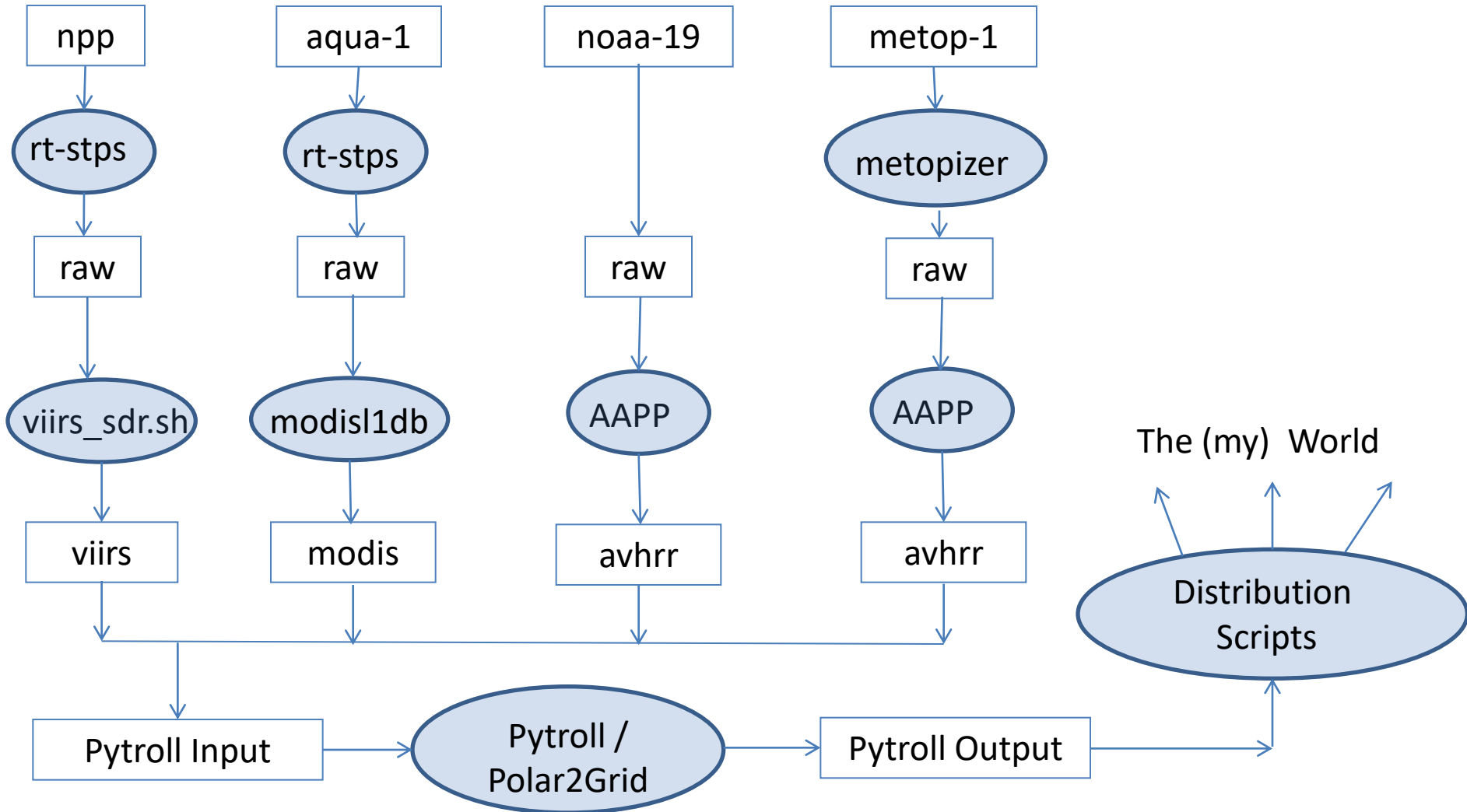
User Needs

- Operational Forecasters
 - Imagery / Level 2 products for diagnosis / prognosis / model comparison
- CMC Nowcasting Program
 - Interested in many Level 2 products to use within automated guidance
- Data Assimilation
 - Radiances, Cloud Masks, AMVs, etc.

INITIAL GOALS FOR INVESTIGATING CSPP

- More / Better POES single channel and L2 products
- Merge GOES / POES processing stream
- Get Ready for GOES-R
 - Prototype new POES processing to aid in decisions for new GOES-R processing
 - Prototype POES output to develop new configurations for Ninjo
- **Single set of processing scripts for all satellite imagery**

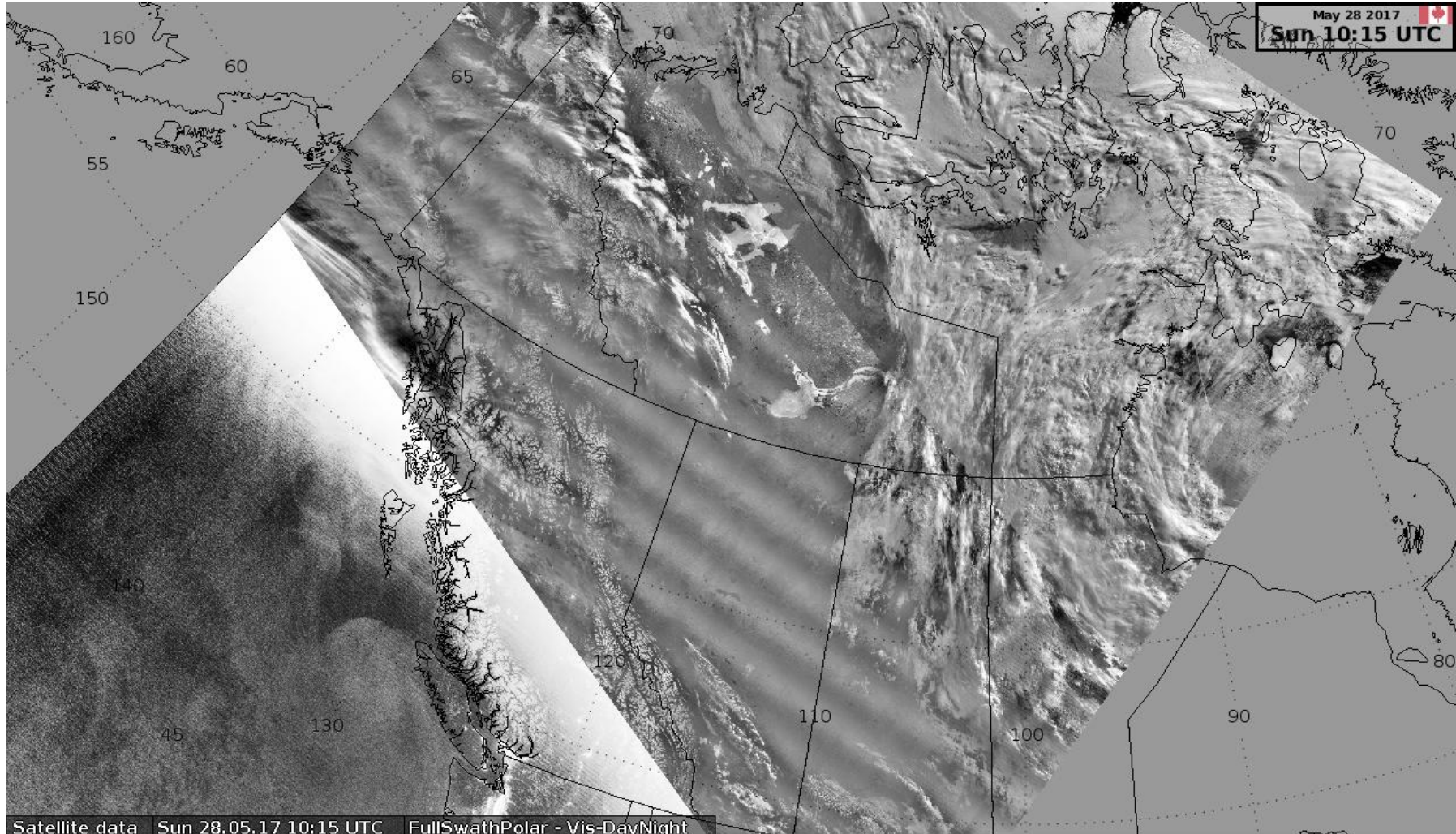
POES Level 1b – Single Channel



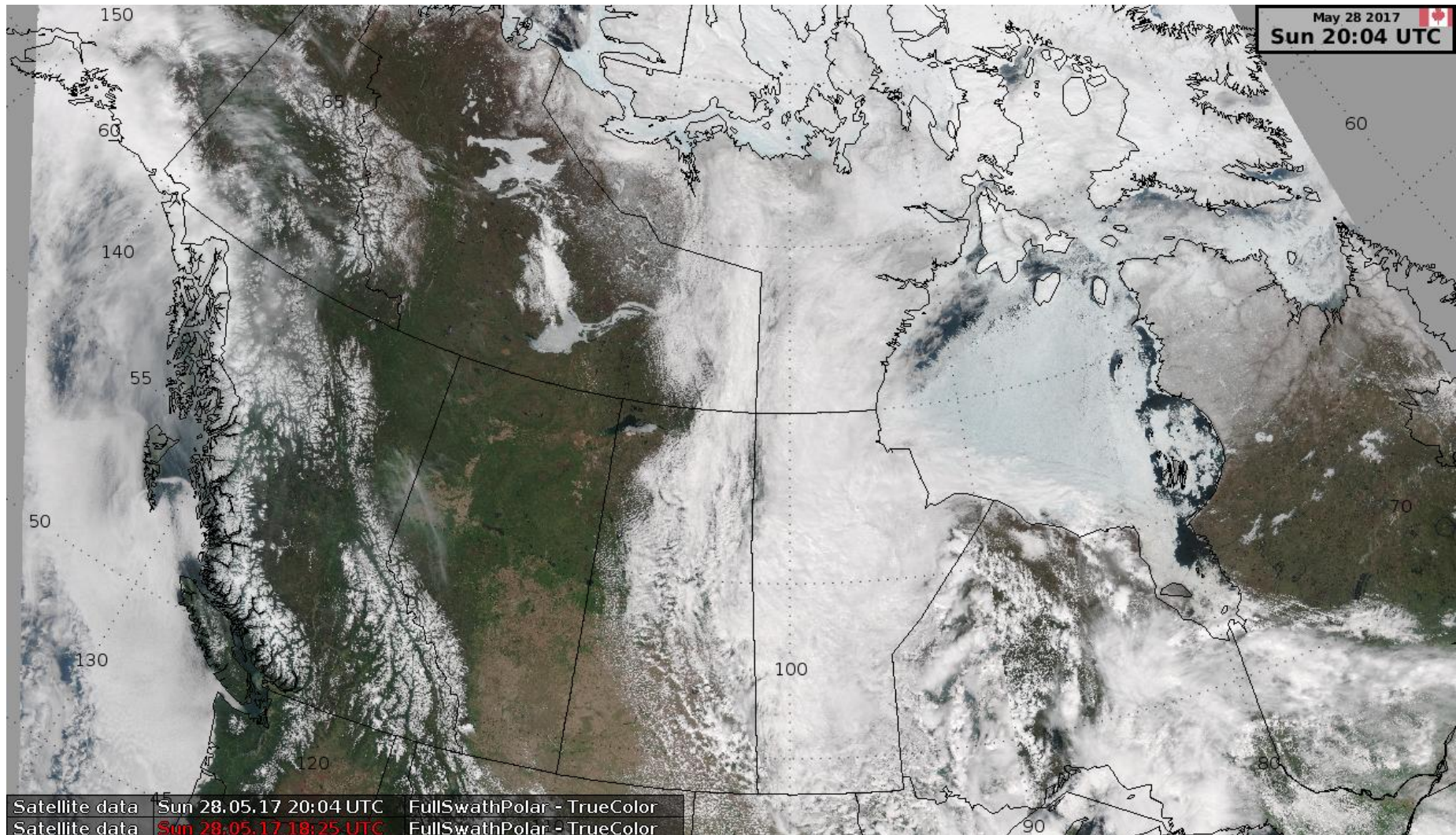
Pytroll vs Polar2Grid (older versions)

- Polar2Grid Advantages
 - Plug and Play
 - From input data -> output image requires little user-effort
 - Faster
 - Built-in specialized enhancements
 - Rayleigh-Corrected True Colour Imagery
 - Day Night Band

P2G DNB Adaptive in NinJo



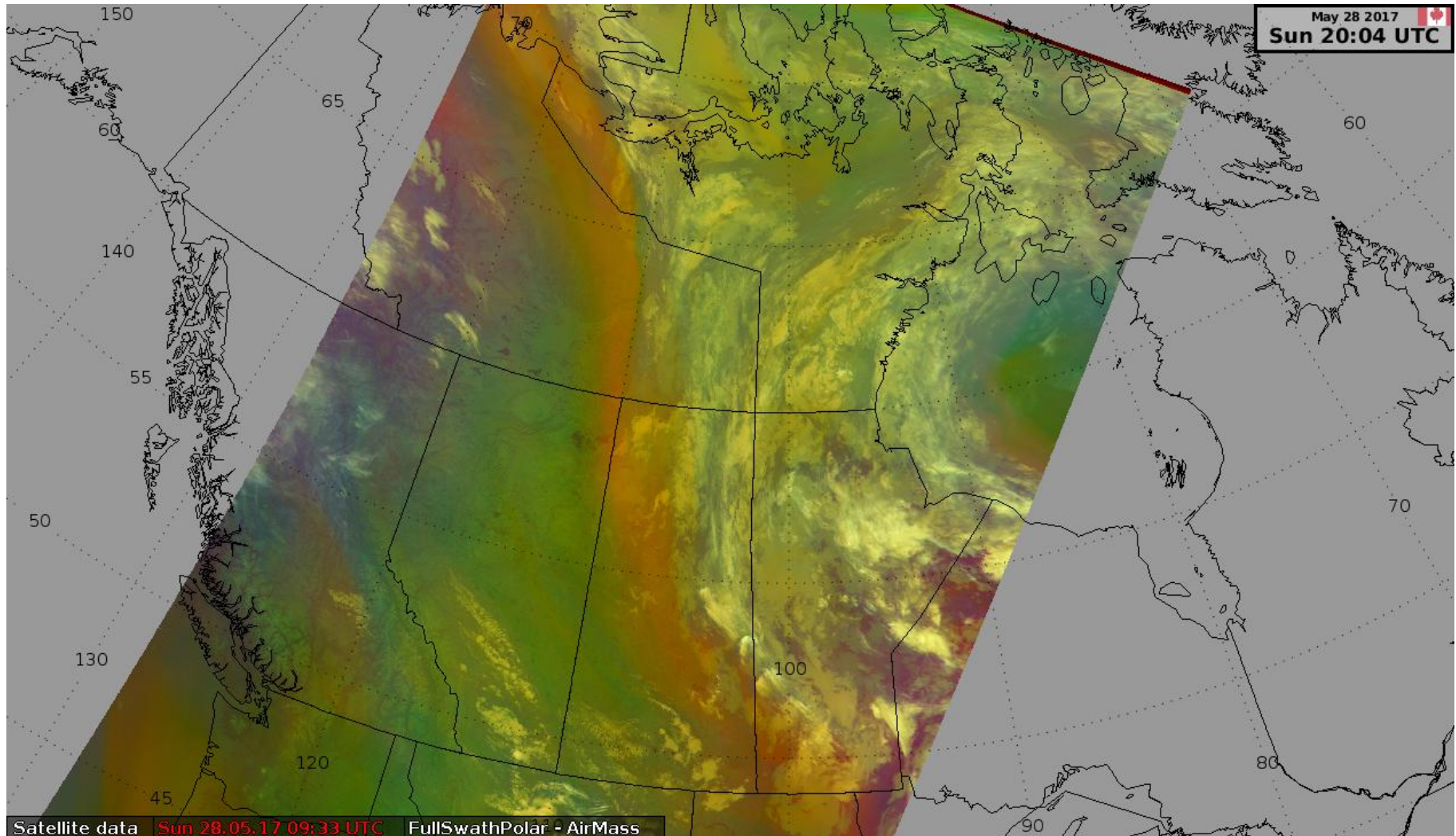
P2G True Colour In Ninjo



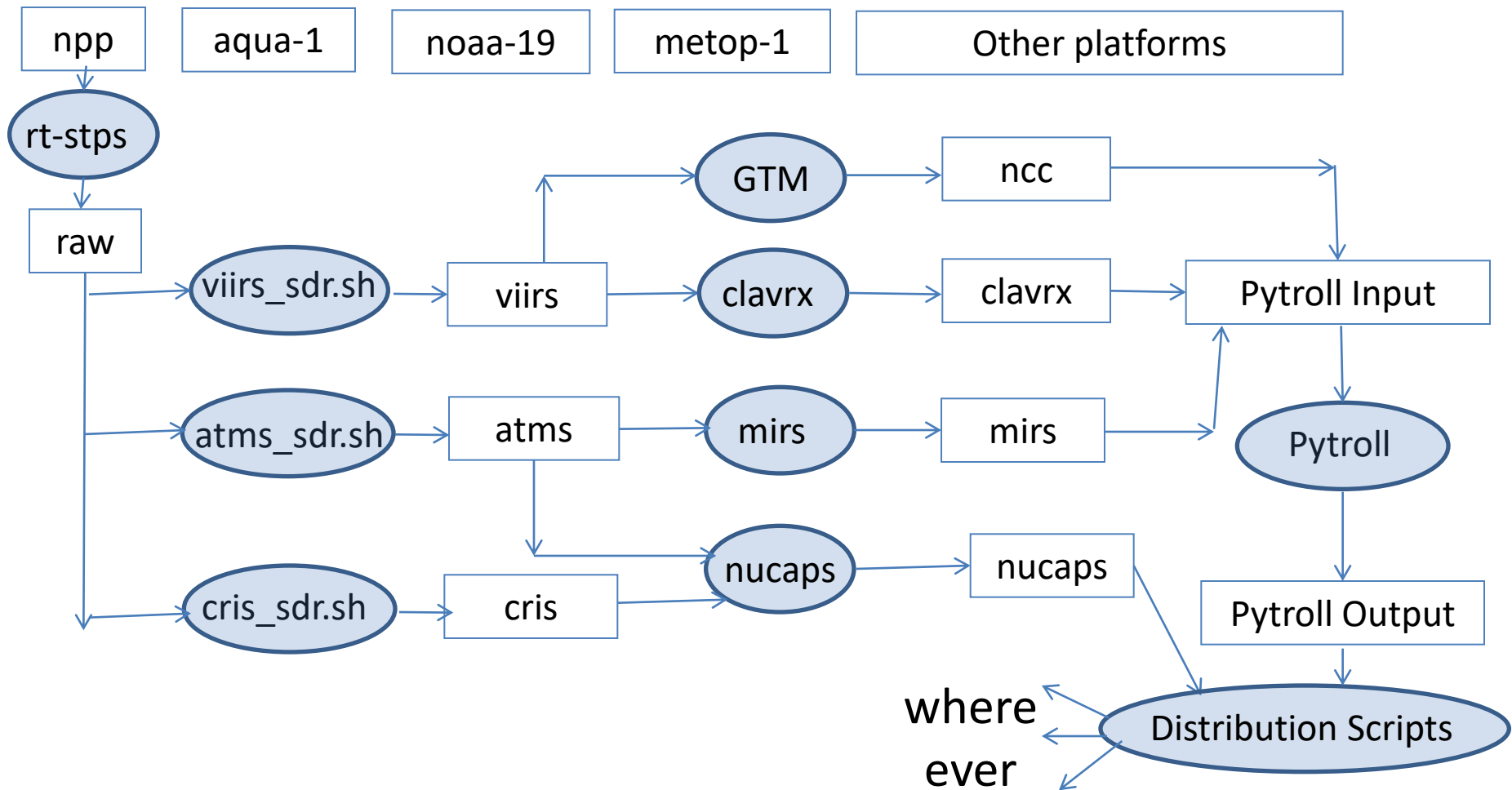
Pytroll vs Polar2Grid (older versions)

- Pytroll Advantages
 - More flexible
 - Easily incorporate custom-code for local needs
 - Able to access max/min values of data
 - Add to geotiff metadata for downstream use
 - Easier to create new RGB imagery
 - Example –adding AirMass cumbersome in P2G.

P2G AirMass in NinJo



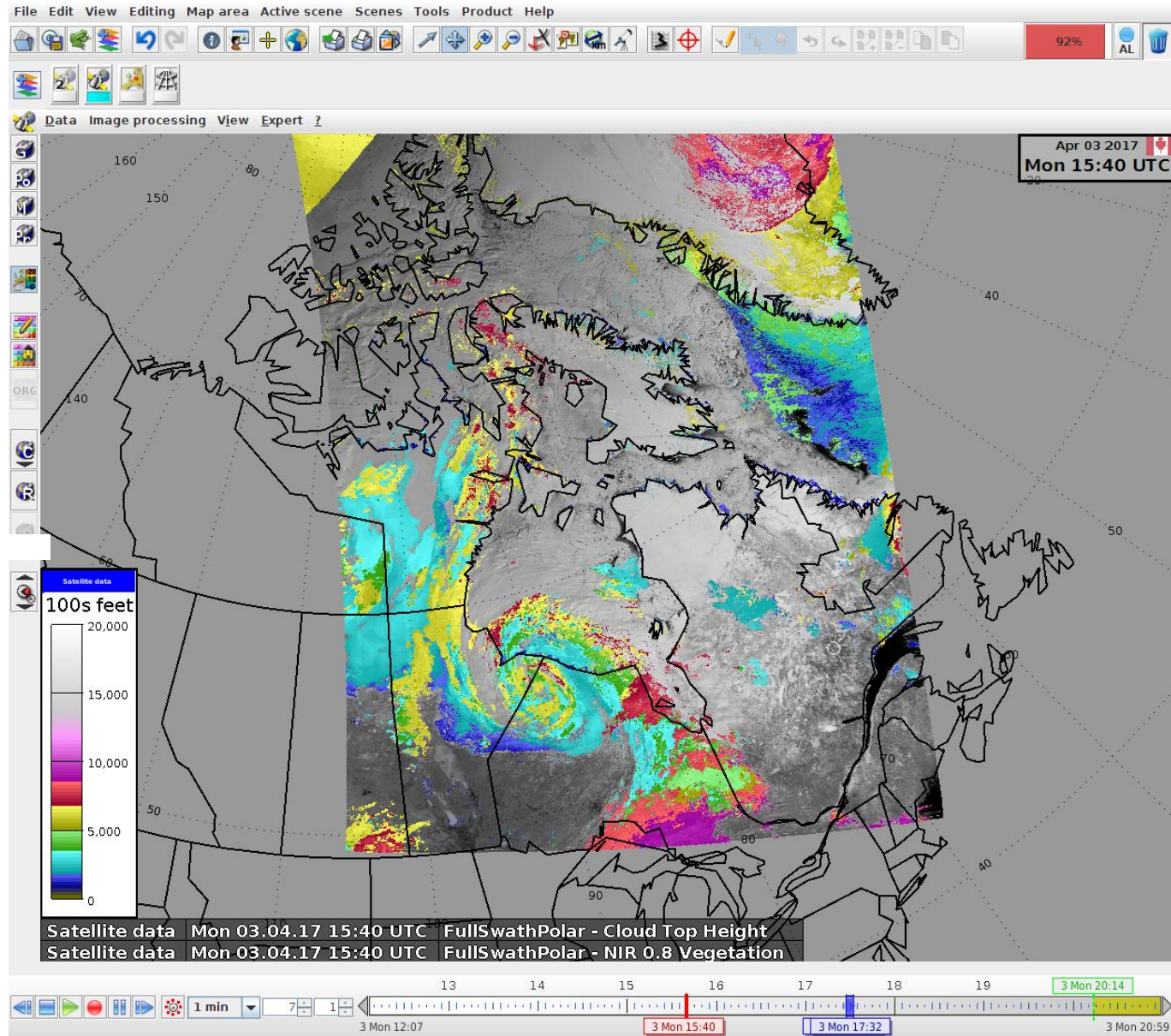
Level 2 – Example for VIIRS



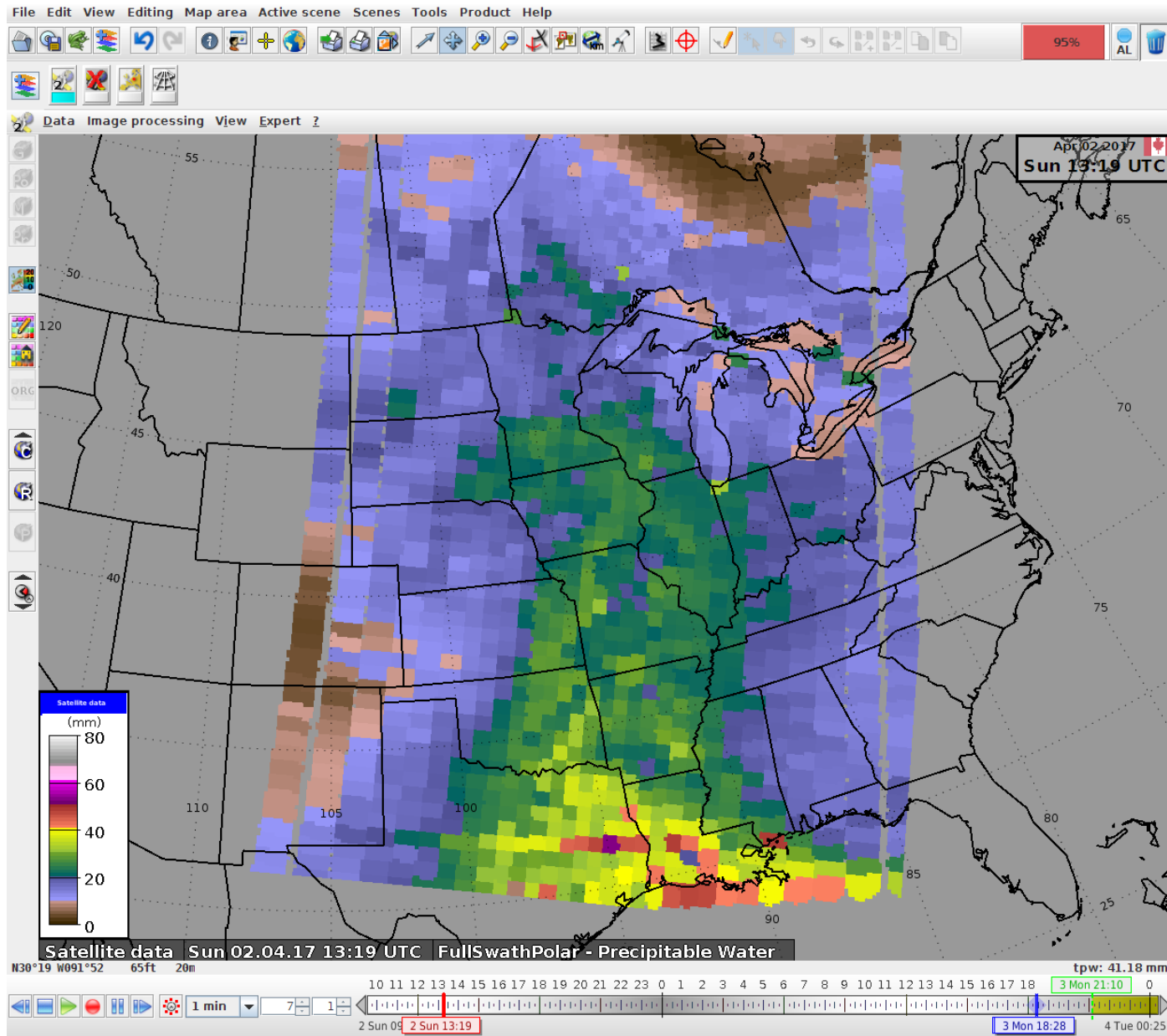
Pytroll vs Polar2Grid (older versions)

- Polar2Grid
 - Not configured to handle out from some routines
- Pytroll
 - Able to adapt existing procedures to handle all routines
 - Required only new configuration files
 - Required only new reader for netcdf output files.

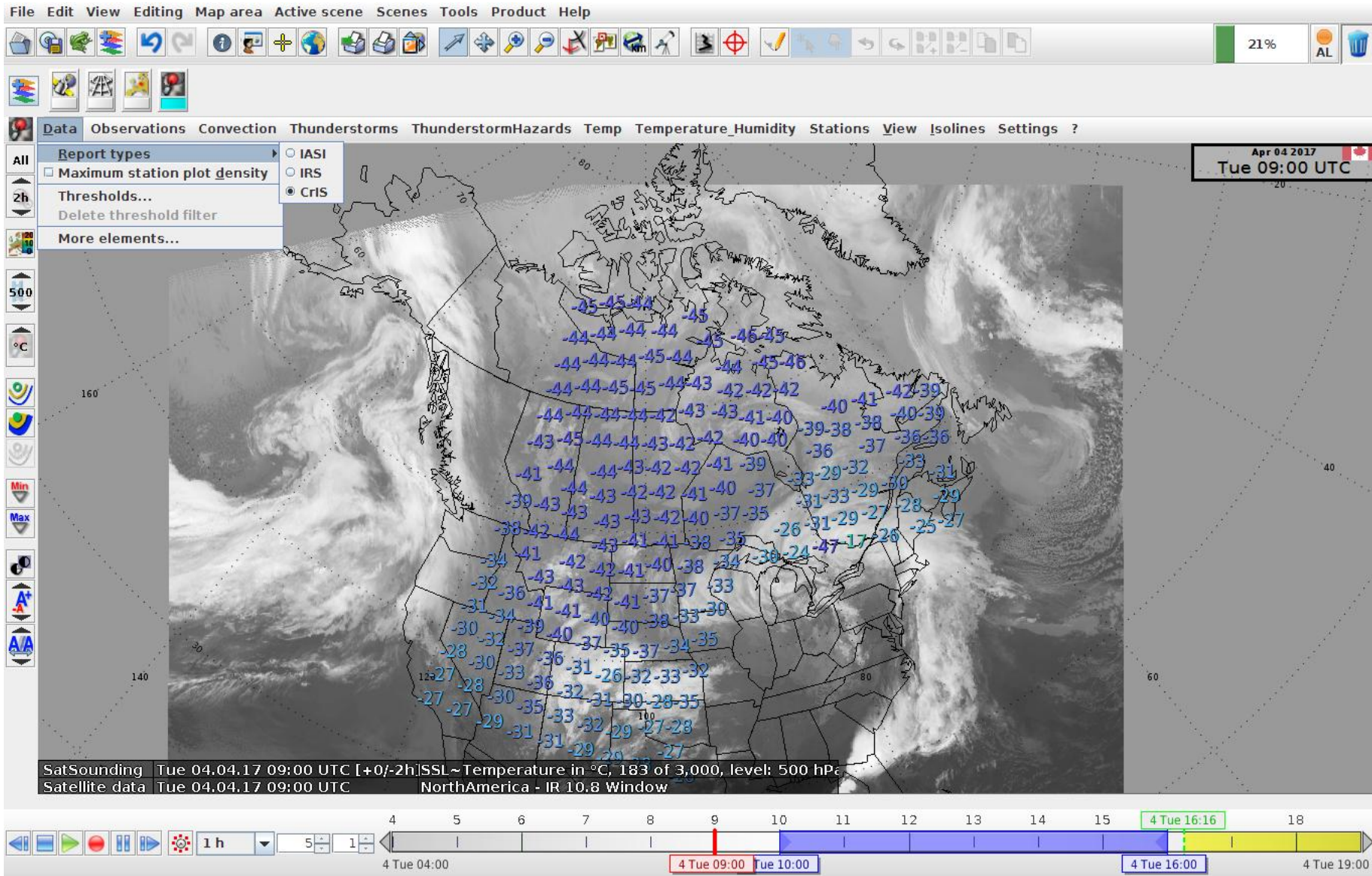
CLAVRx Cloud Top Height in NinJo



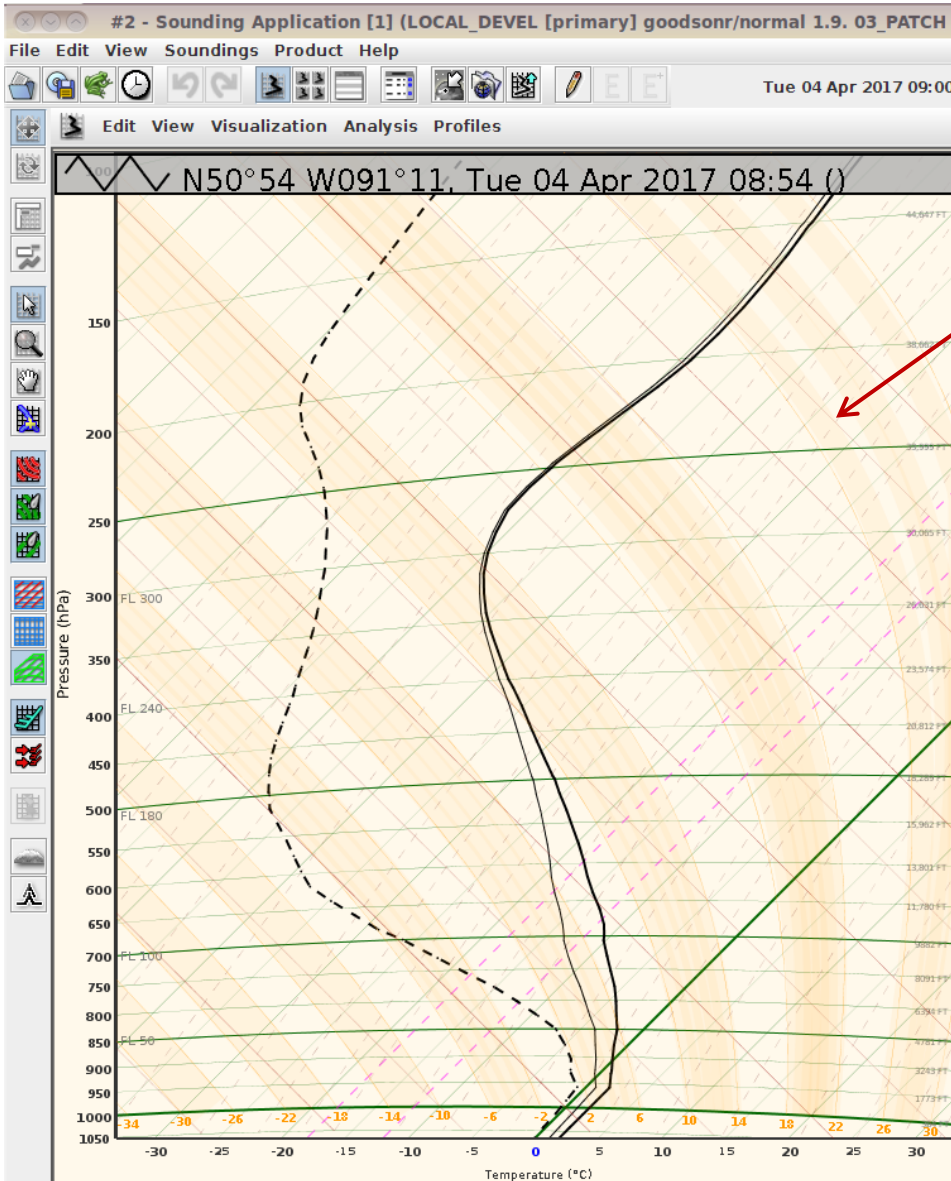
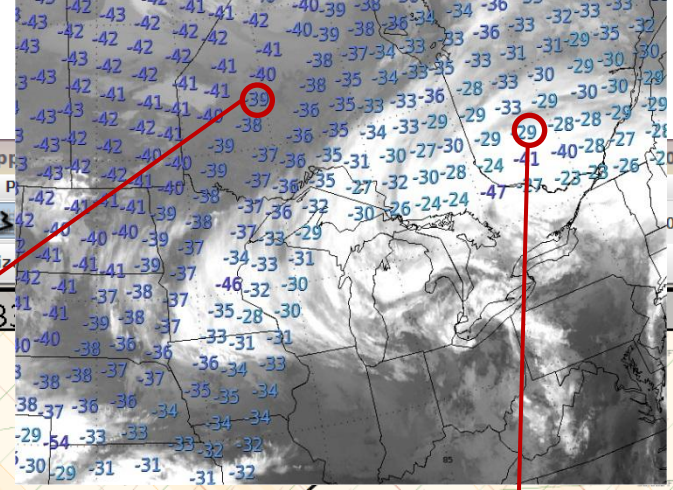
MIRS Precipitable Water in NinJo



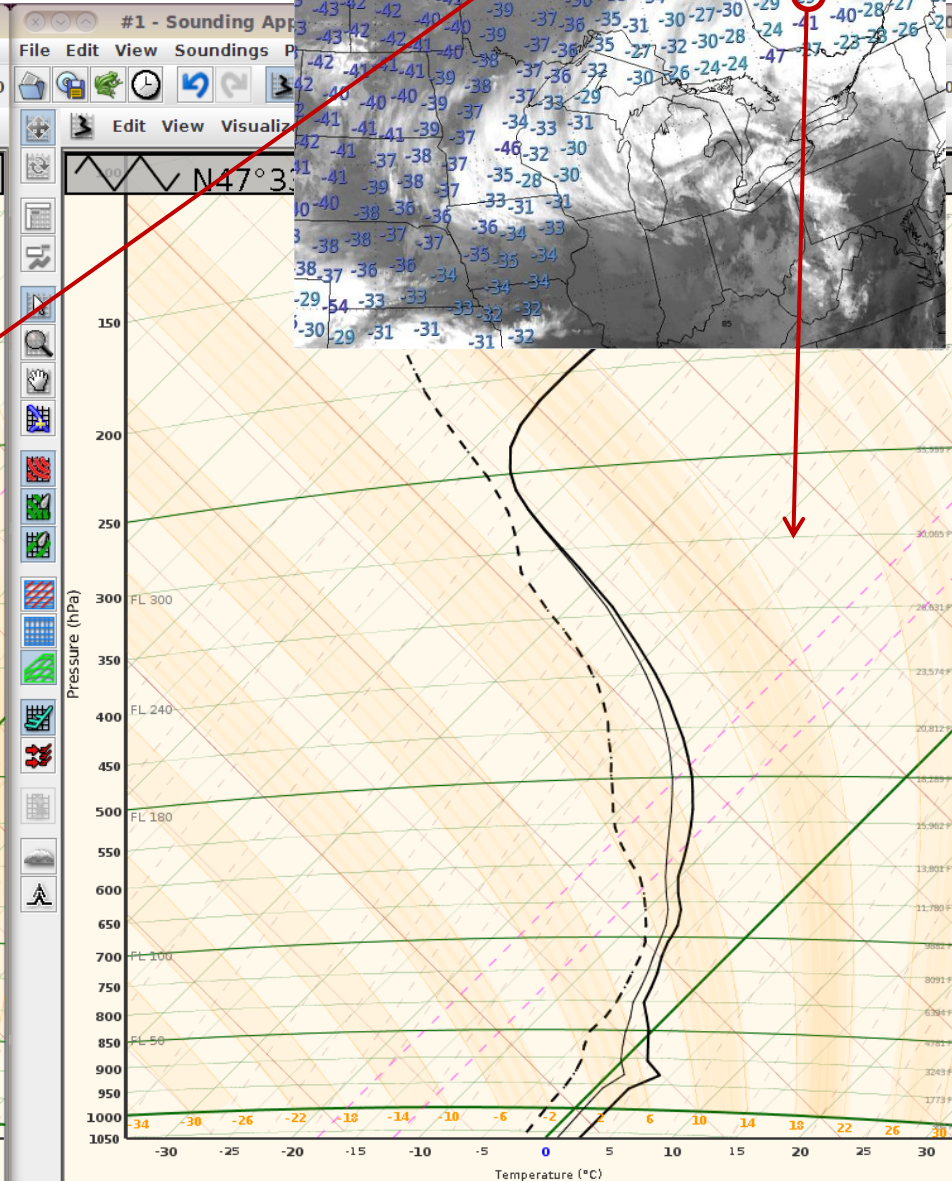
NUCAPS Soundings in NinJo



NUCAPS Soundings



N50°54 W091°11, Tue 04 Apr 2017 08:54 0
 227hPa 35,099ft (10,698 m) MSL -50,180ft (-15,295 m) GND T: -50.5°C Td: -71.4°C Tw: -50.9°C
 [227hPa FL 360 -47.2°C]

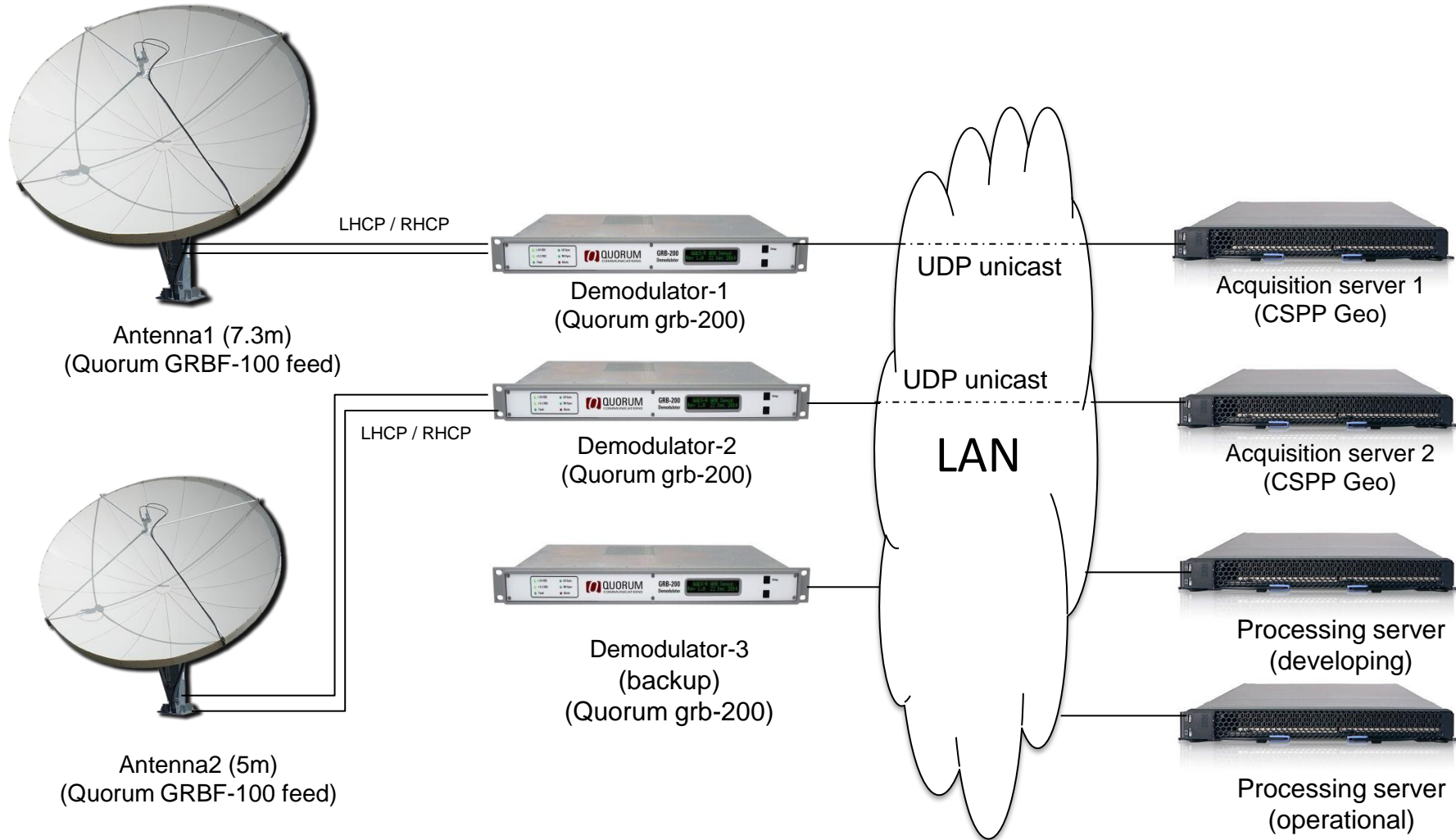


N47°33 W074°37, Tue 04 Apr 2017 07:14 0

Advances in Pytroll / Polar2Grid

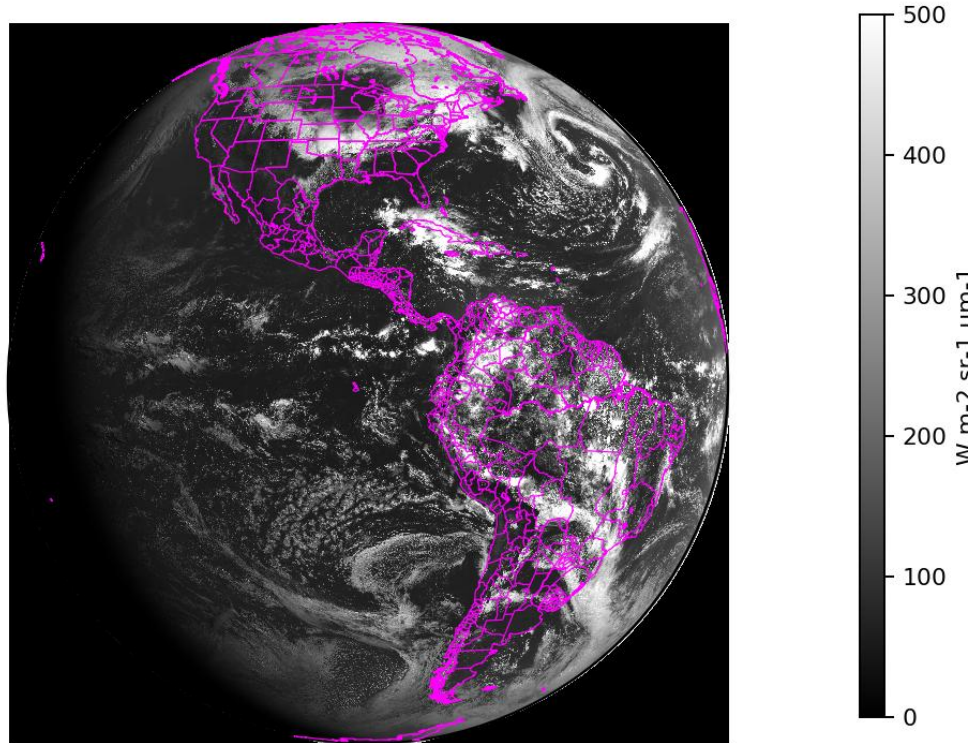
- Applaud efforts of combining Pytroll & Polar2Grid through satpy
 - Plaudits to Martin Raspaud and David Hoese
- Best of Both worlds
 - Faster
 - More flexible
- Have chosen Pytroll - easier to bend to local needs
 - Ability to stub-in local readers (while waiting for official versions)
 - Ability to incorporate / merge with other python modules

GOES-R Receiving System - CMC



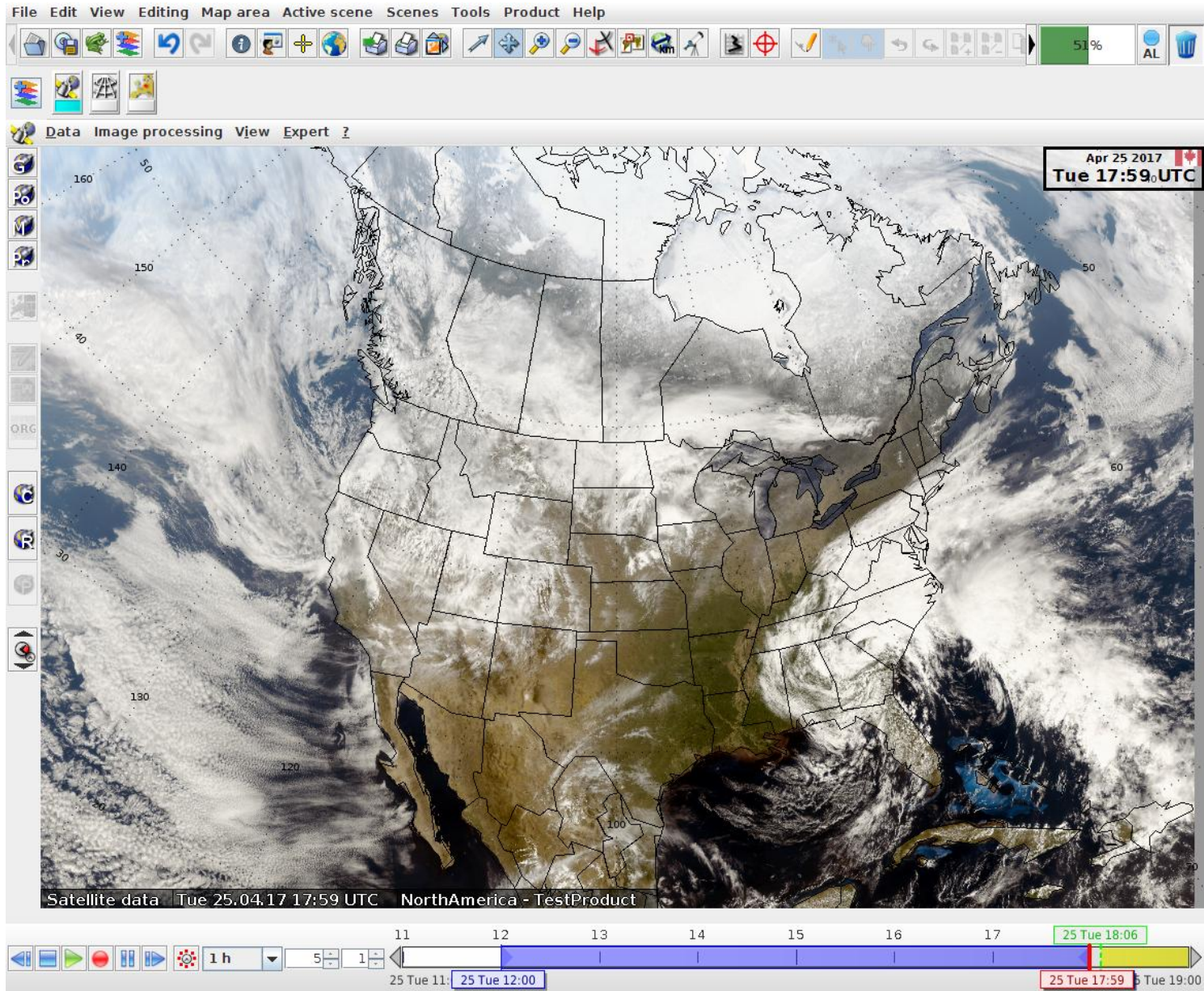
The First GOES-R Image at CMC

GOES-16 ABI L1b Radiances Channel 1
2017-04-21 151522.4



The first image of GOES-R receiving system at CMC was produced by **CSPP-Geo-GRB** and quick-look script. *Many Thanks to the CSPP-GEO Team*

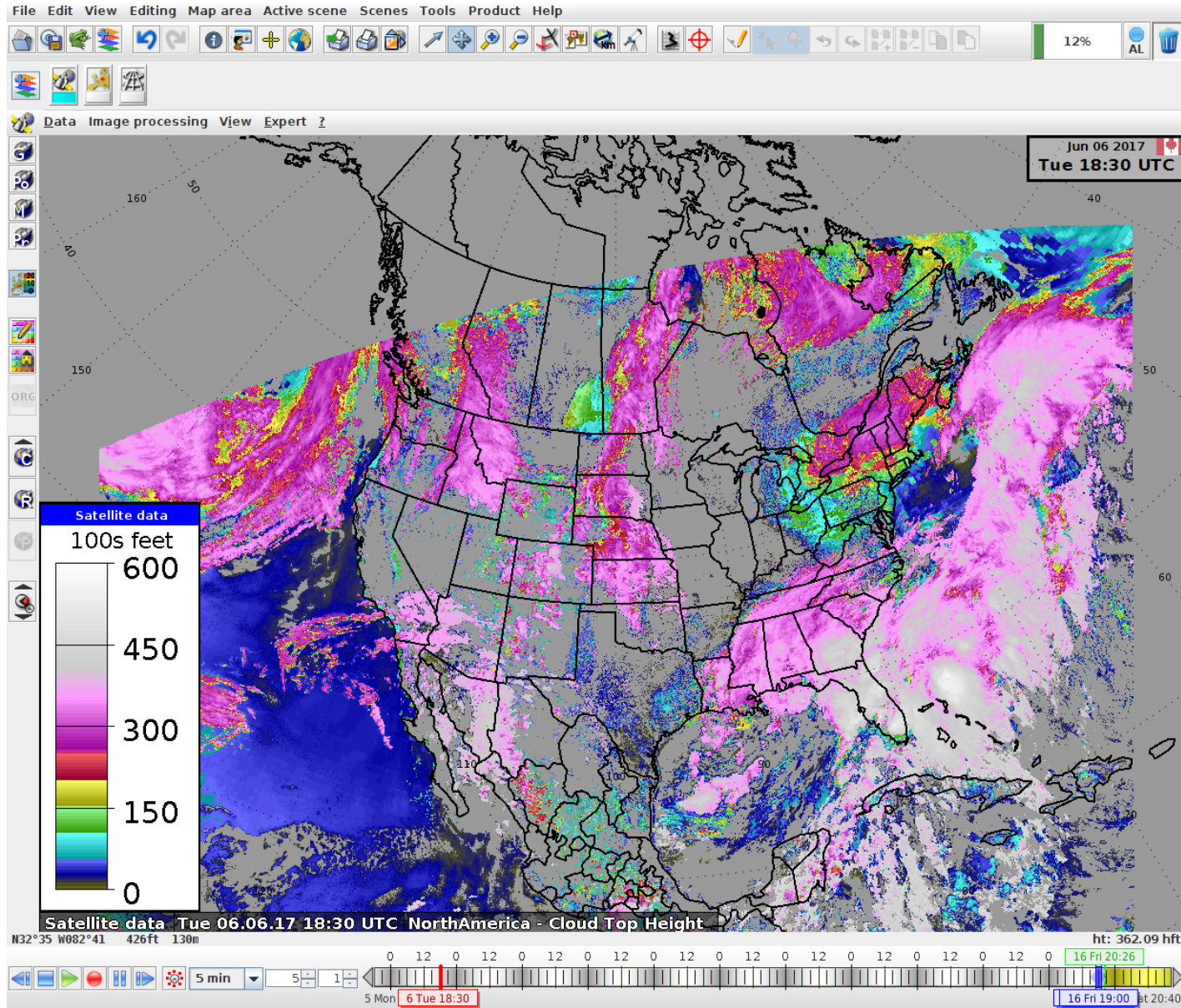
Pytroll/satpy GOES True Colour in NinJo



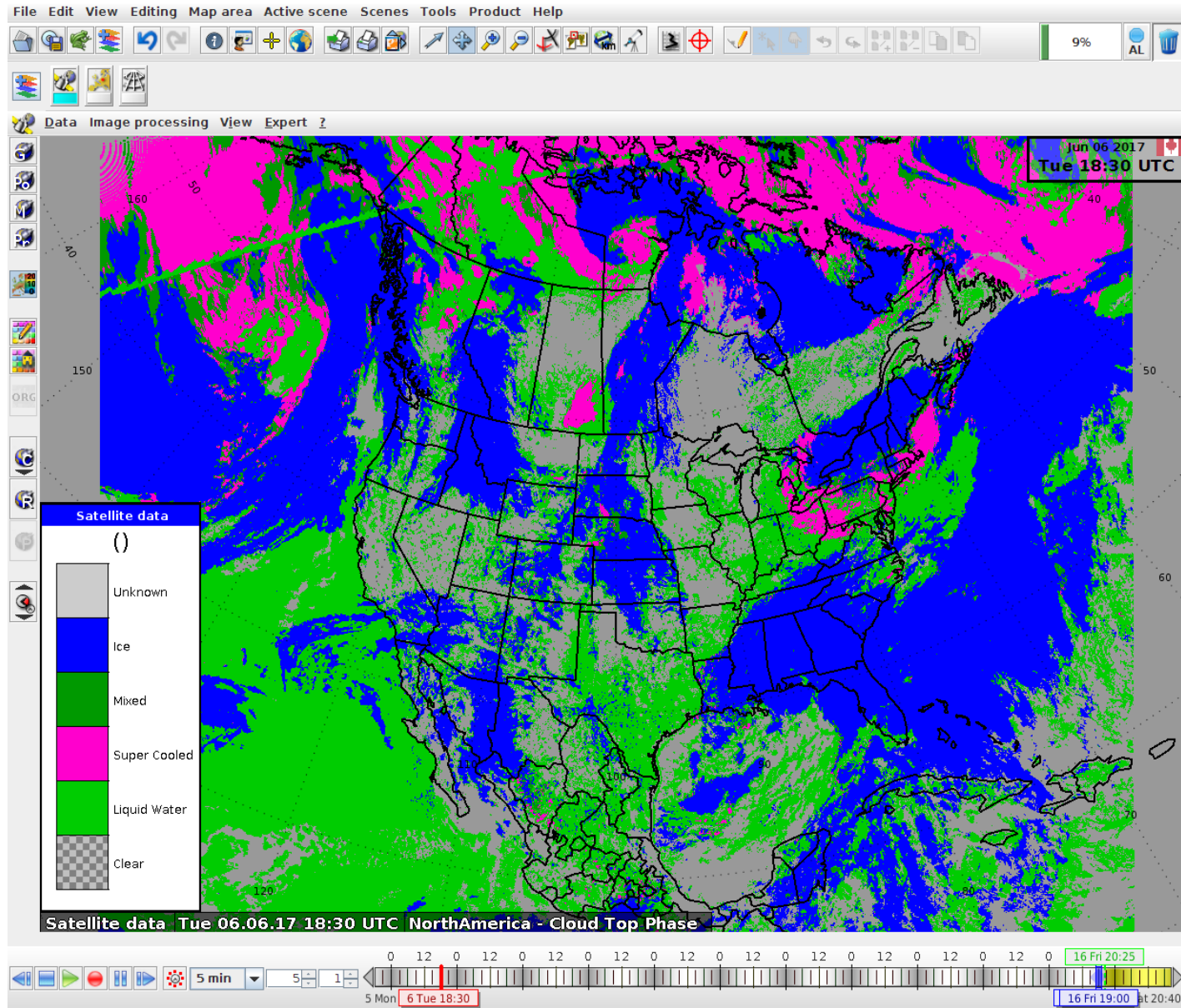
CSPP-Geo Level 2 Products

- Operationally – will obtain level 2 products via PDA
- Have tested early version of CSPP-Geo software
 - Could use as “back-up”
- Will create imagery for NinJo with Pytroll / satpy

Cloud Top Height



Cloud Top Phase



Future – Short and Long

- Create routines to use CSPP-GEO GRB track files to begin processing before end-of-pass
- Improve interm satpy readers for GOES Level 2 products
 - while following Pytroll/P2G developers
- Implement Pytroll for generation of POES imagery
- Implement CSPP for creation of POES Level 2 Products