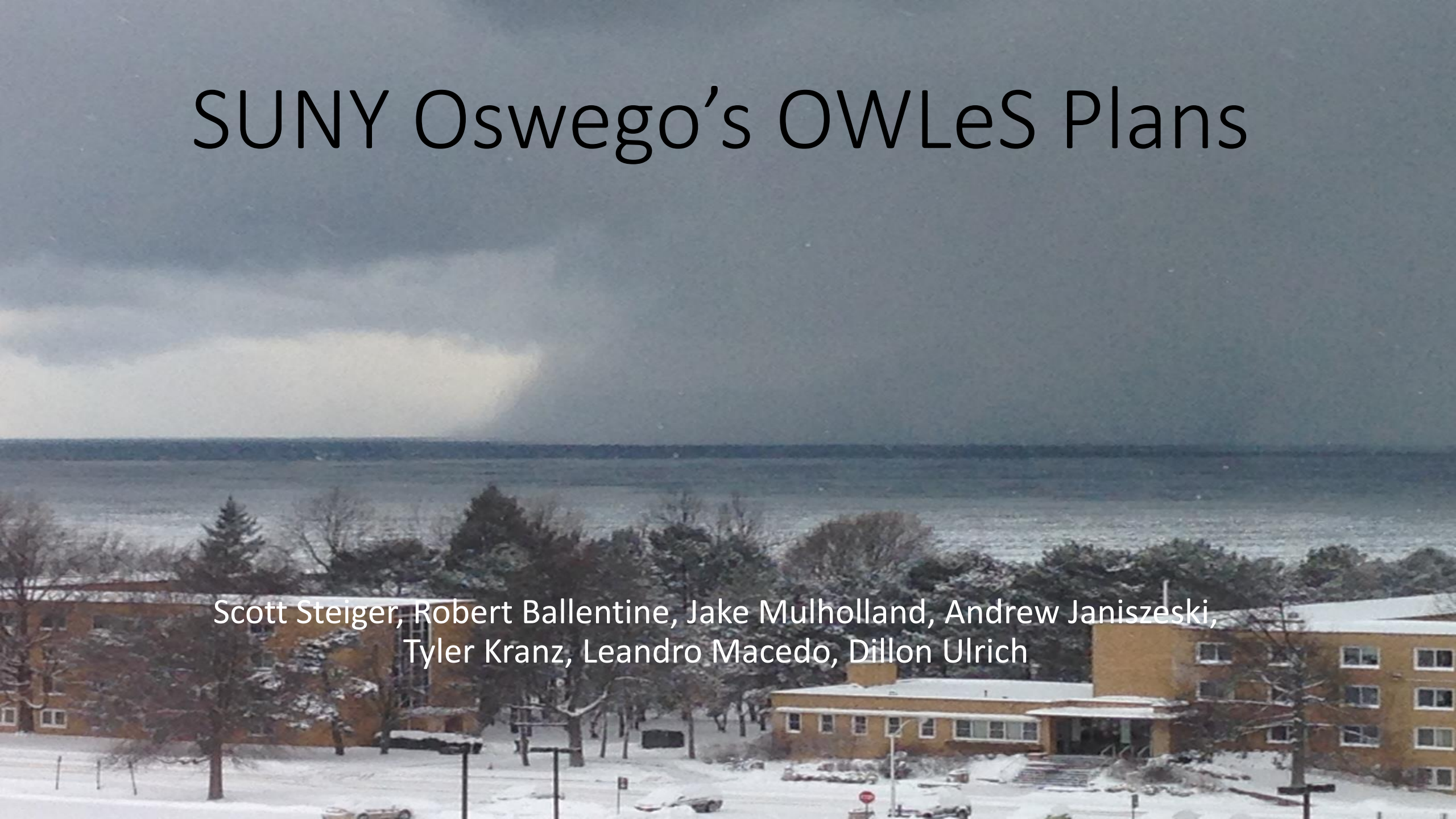
SUNY Oswego's OWLeS Plans



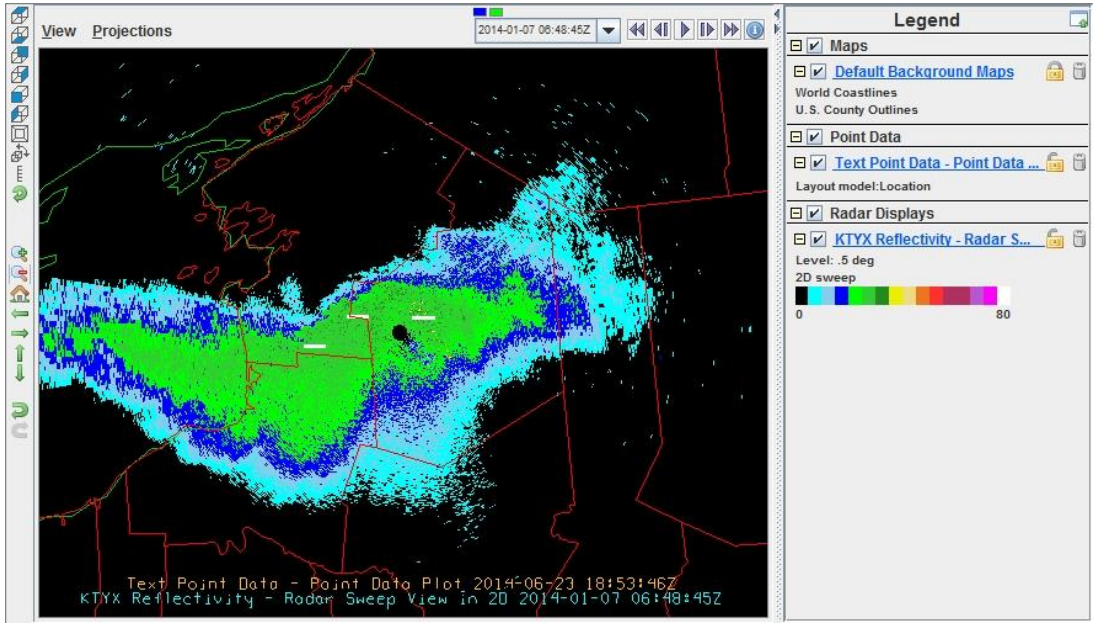
Scott Steiger, Robert Ballentine, Jake Mulholland, Andrew Janiszeski,
Tyler Kranz, Leandro Macedo, Dillon Ulrich

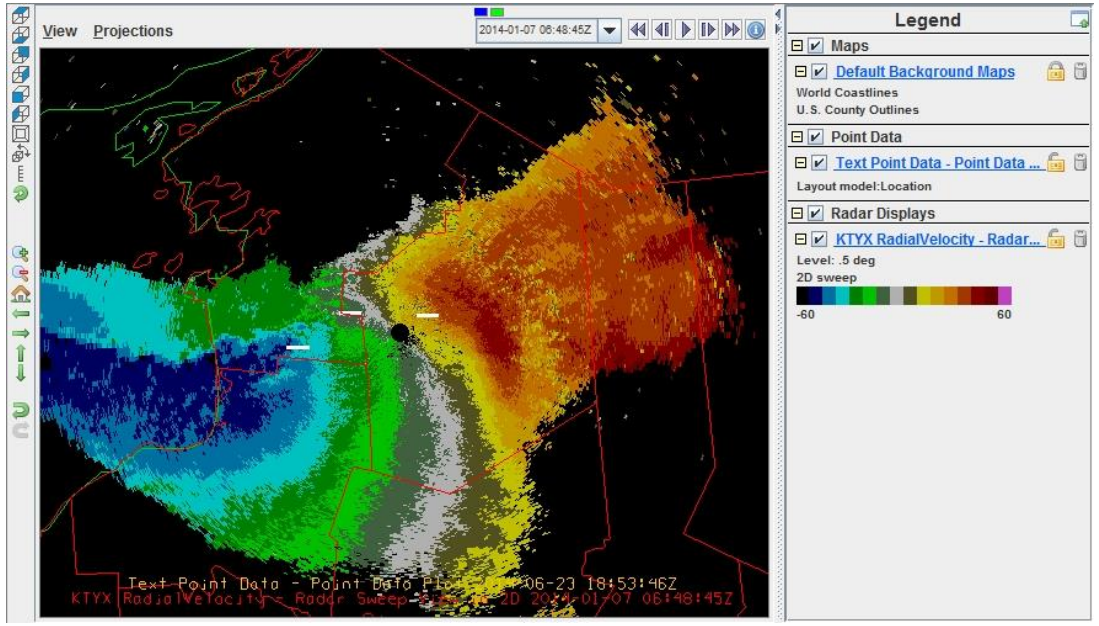
Foci

- Lightning (Macedo & Steiger)
- Modeling (Ballentine, Janiszeski, & Ulrich)
- Ice cover issues (Kranz & Ballentine)
- Misocirculations and boundaries (Mulholland)
- Lake-to-lake effects? (Kranz)
- Hydrometeor typing (Mulholland)
- Issues raised by Steiger et al. (2013): Explore enhanced p-gradients on band's south side (greater HSI)? More horizontal vortices, BWERs? Need thermodynamic obs. over lake and land simultaneously (colder outflow?); how do boundaries form?

Lake-effect Lightning: 7 Jan 2014 0649 – 0654Z

ENTLN lightning data





No relations found with dual-pol variables (NEXRAD)

Other cases: 12/11/13, 12/18/13, 1/27/14

OWLES SUMMER PROJECT

LEANDRO MACEDO / Dr. HUMBERTO BARBOSA

PIs: Dr. Steiger and Dr. Ballentine

OSWEGO, NY
2014

RESEARCH GOALS

- To understand the relationships between environmental parameters and lightning and non-lightning storms in long-fetch LeS cells;
- Compare different phases (e.g., ice/supercooled water) of LeS clouds using satellite and UWKA data and lightning information;
- Generate new ideas/hypotheses about LeS.

DATA AND METHODS

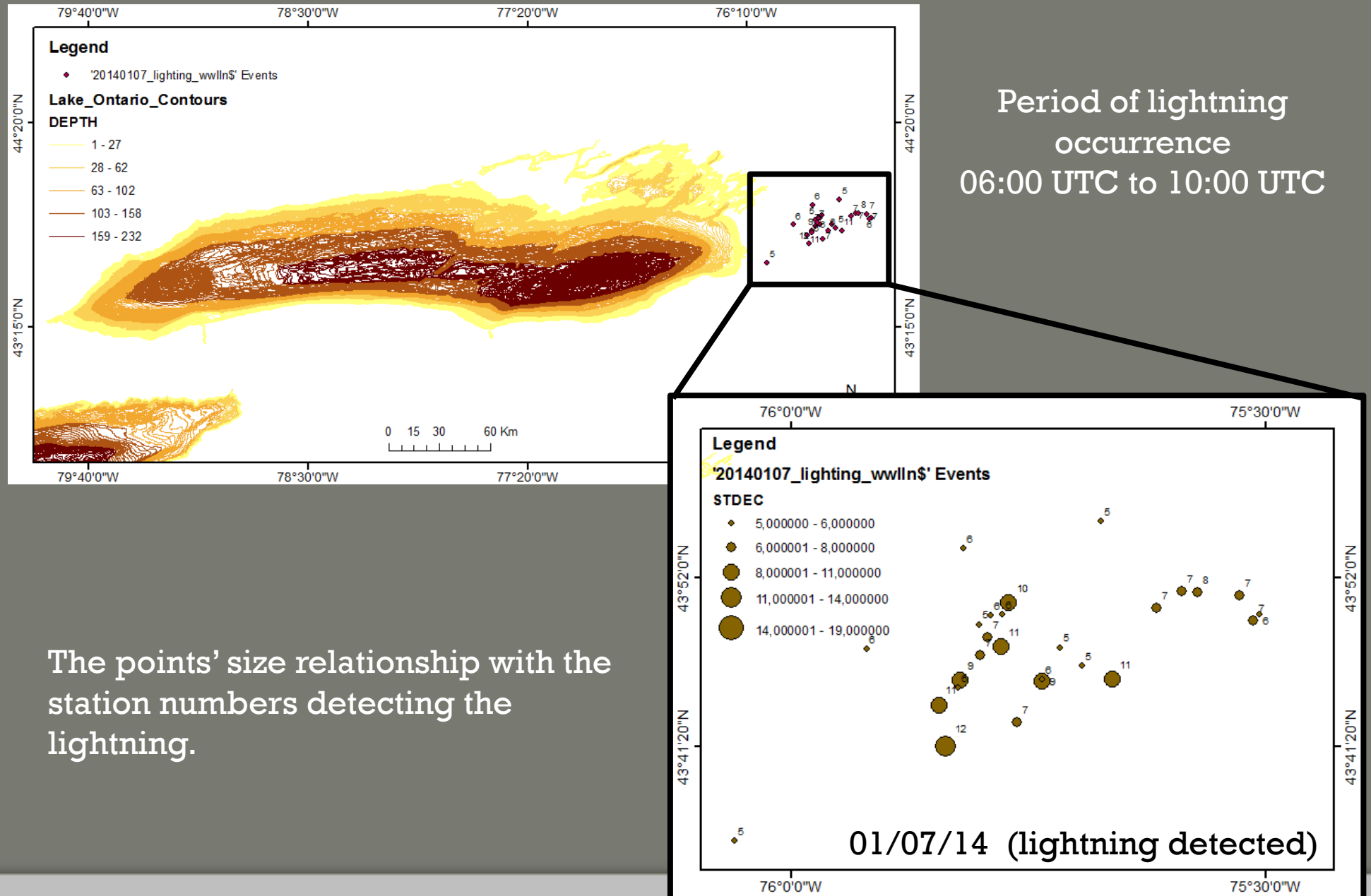
DATA

- Lightning data through the network WWLLN (http://www.wwlln.net);
- Satellite data - Suomi NPP (VIIRS);
- UWKA hydrometeor data
- Lake Ontario and Lake Erie bathymetry data;

METHODS

- Processing of the lightning data by programming shell script and convert for output format CSV or XLSX;
- Processing the Satellite data Suomi NPP (VIIRS) through McIDAS-V software;
- Use the output of the previous steps for integration in ArcGIS/McIDAS-V with Lake Ontario and Lake Erie bathymetry data, and other information;

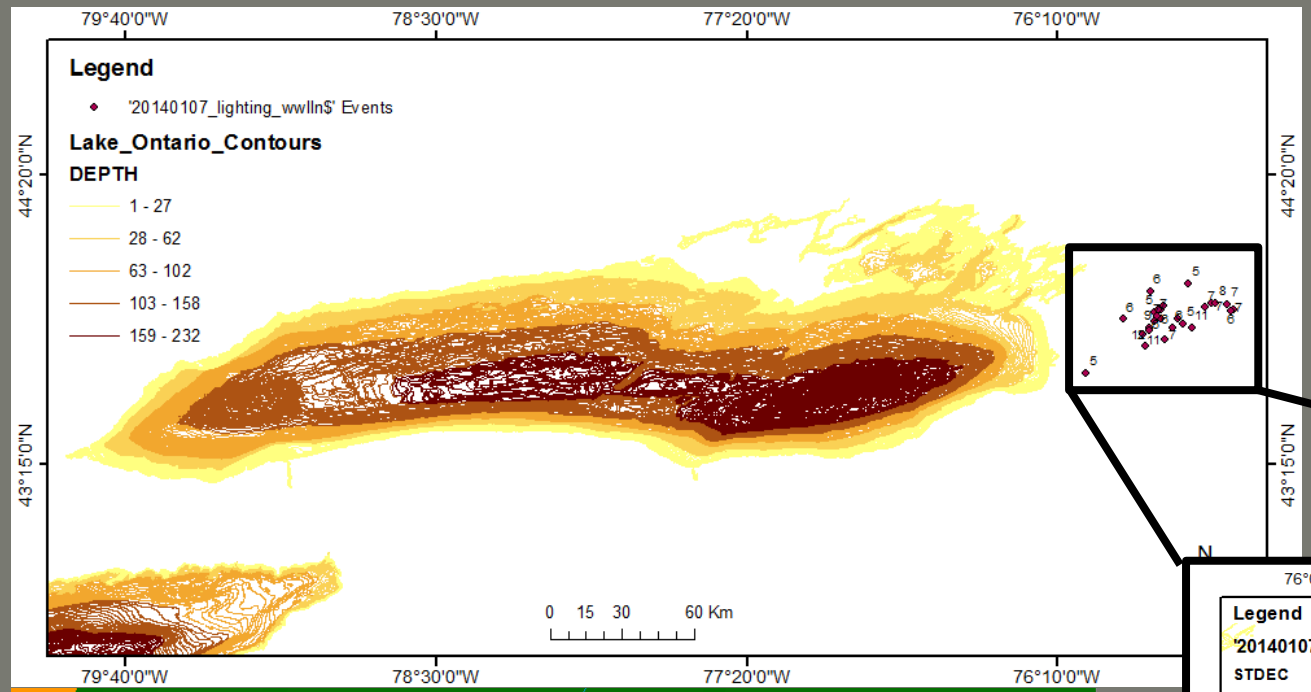
PRELIMINARY EXAMPLES

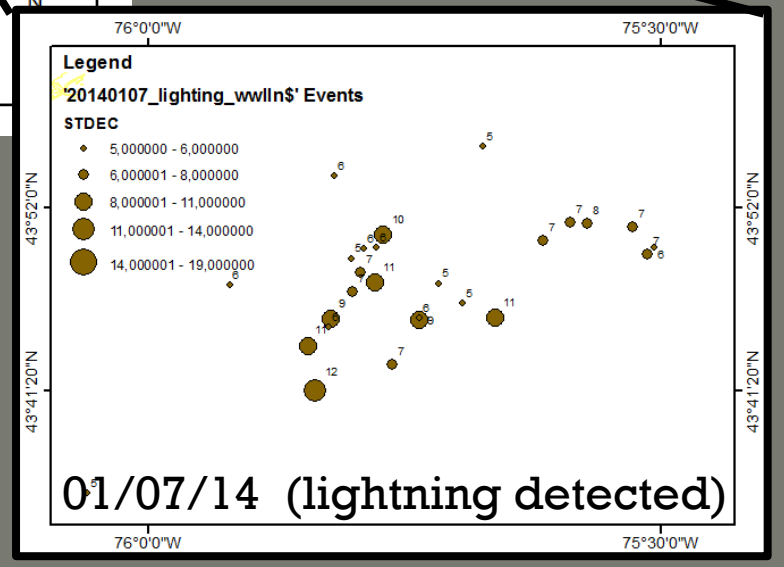


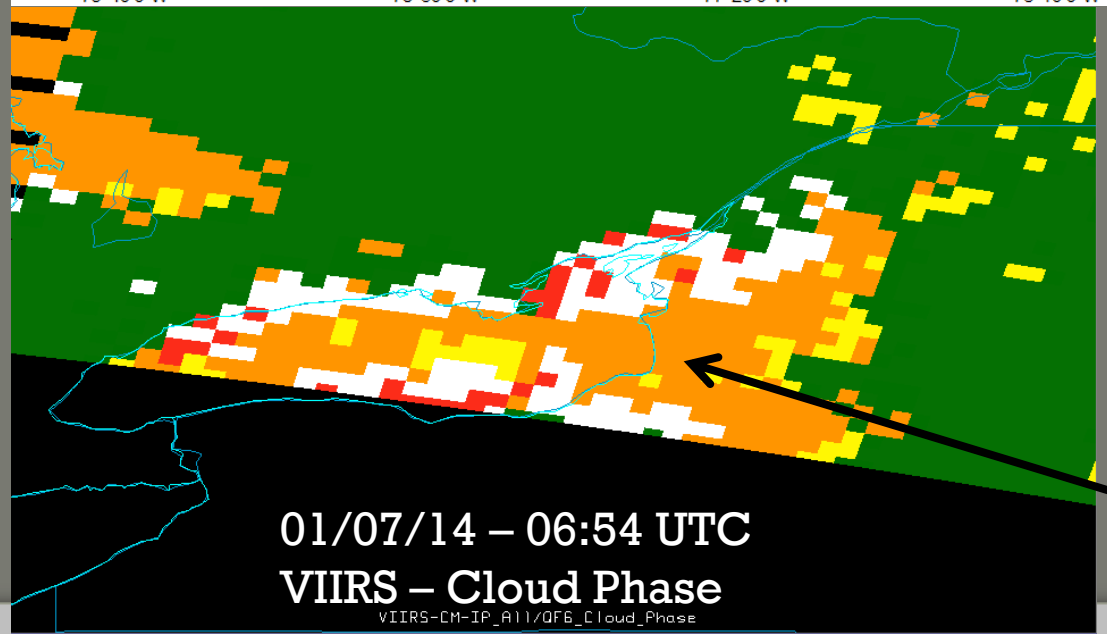
Period of lightning occurrence
06:00 UTC to 10:00 UTC

The points' size relationship with the station numbers detecting the lightning.

PRELIMINARIES EXAMPLES



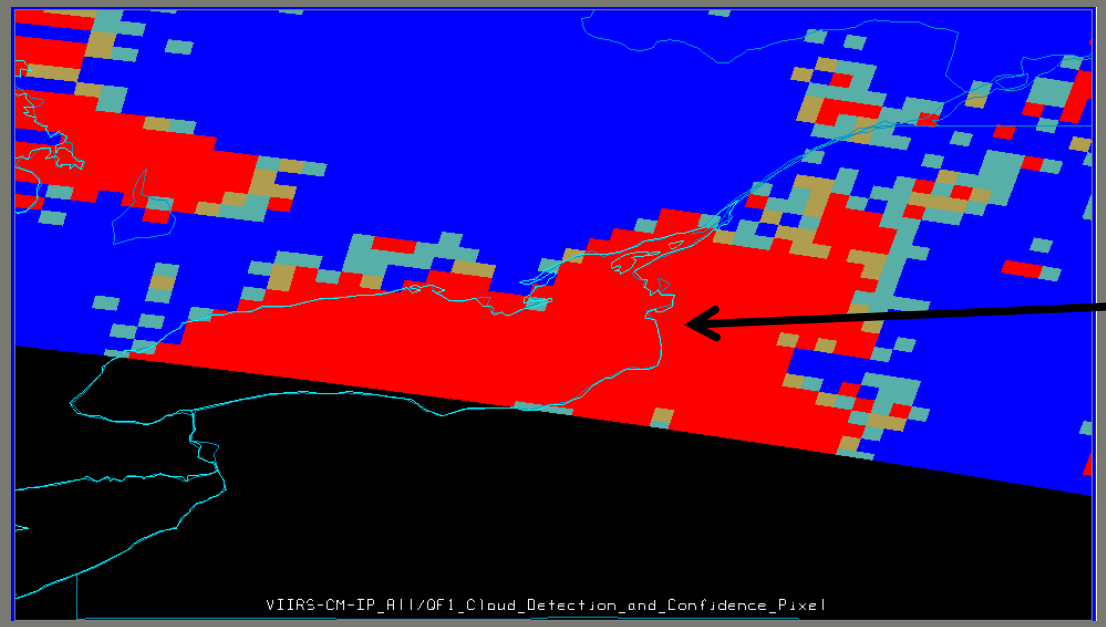




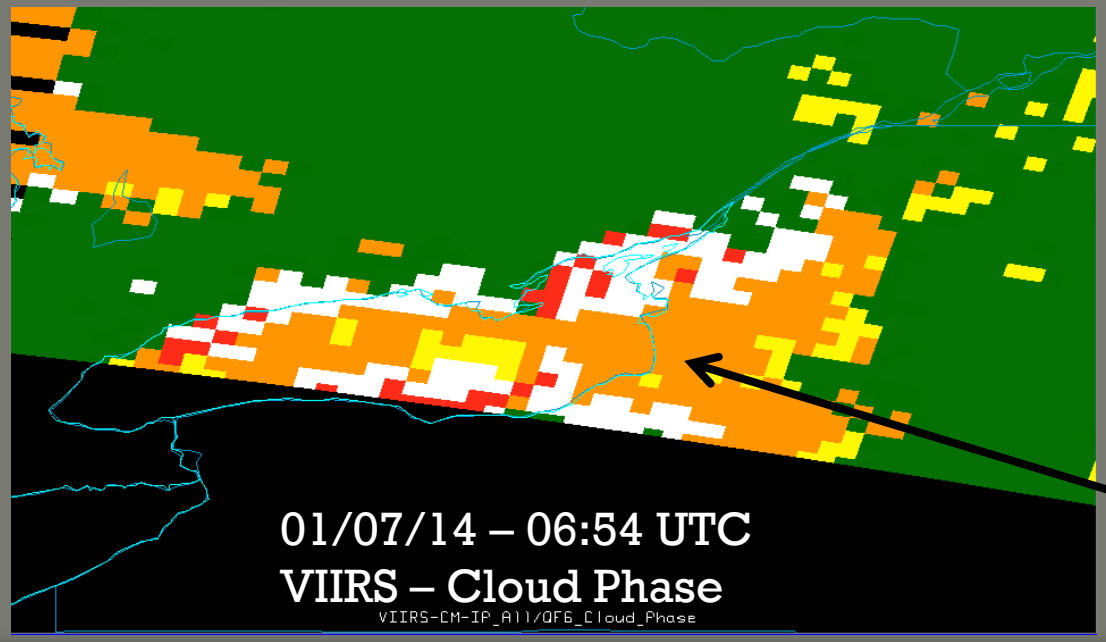
White = mixture of liquid and ice

Cloud ice crystals/ice

PRELIMINARIES EXAMPLES

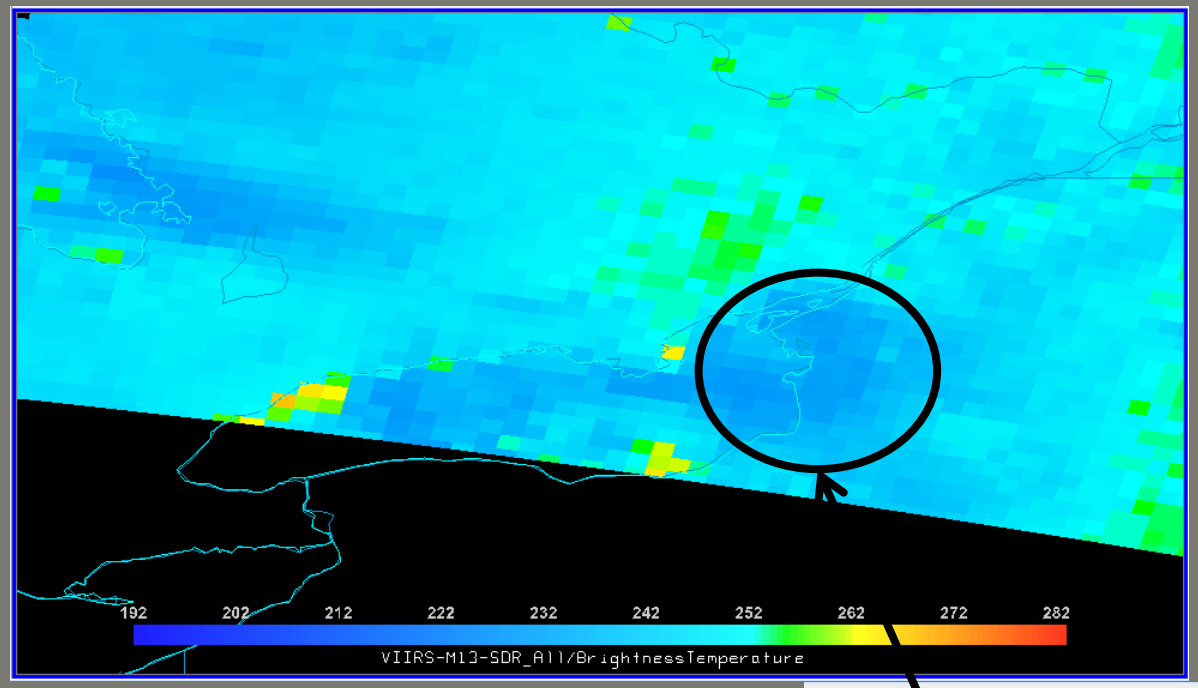


Cloud detected
(confidence pixel)

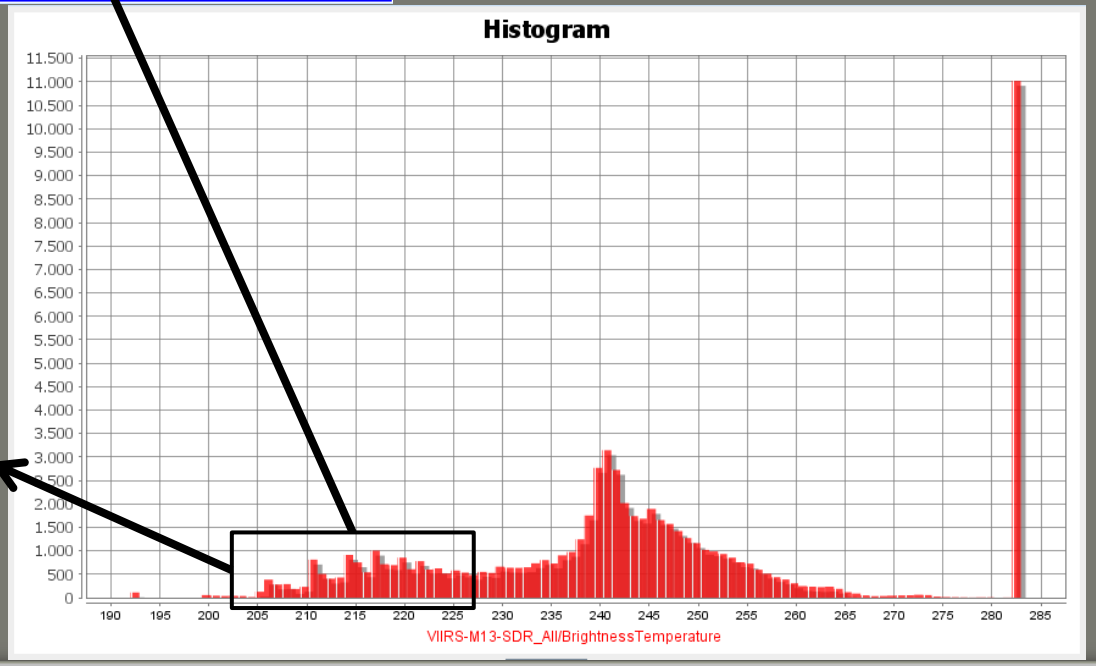


Cloud ice crystals/ice

PRELIMINARIES EXAMPLES

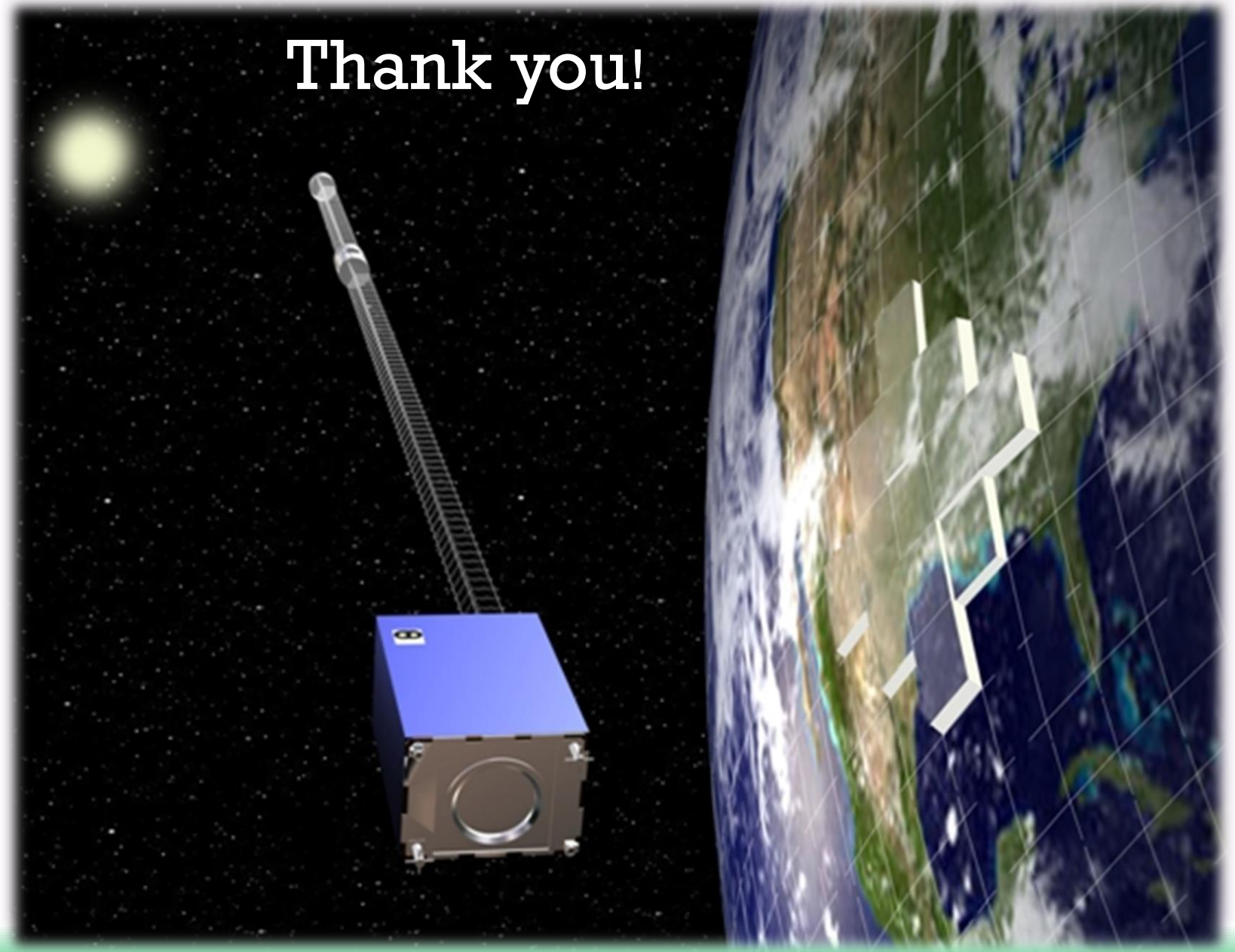


01/07/14 – 06:54 UTC
Brightness Temperature
the cloud top



Brightness Temperature the cloud top between 202K (-71C) and 222K (-51C)
(sounding indicates cloud top T near -48C)

Thank you!



WRF Modeling Research

- Verify WRF model output vs. KTYX radar in IOPs 2, 4, and 7 (12/10-12/13, 12/15-16/13, 1/6-7/14).

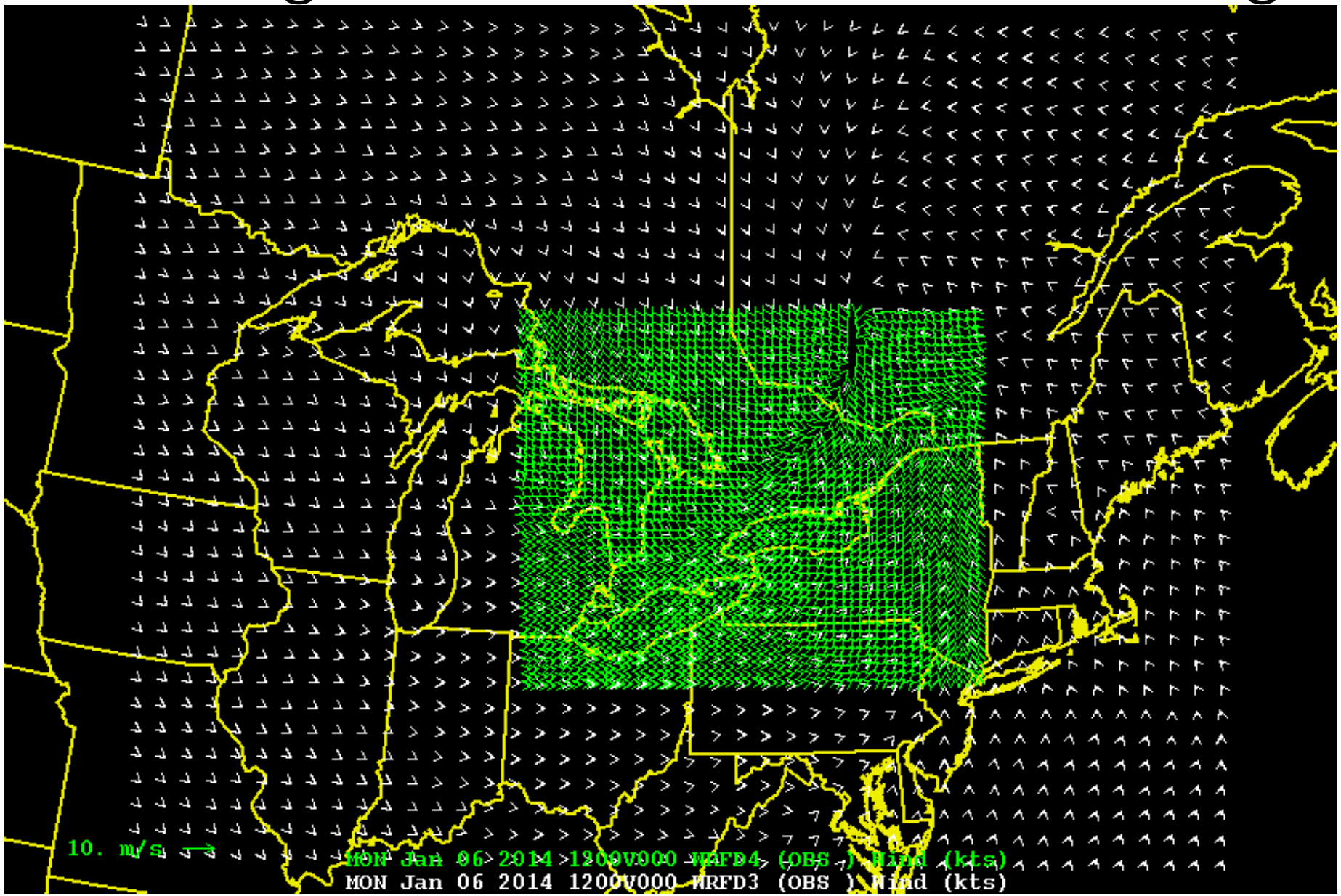
- Identify limitations and errors within computer model simulations which caused inaccuracies in location, intensity, and/or timing.

- Most data for initialization in computer models are available within our archived model runs. NOMADS will be used to acquire data that are not available. KTYX radar data are available via the NCDC.

Numerical Experiment Categories

- 1. Set Control Experiment (OWLeS setup); choose IOPs
- 2. Domain Configuration
- 3. Physical Parameterizations
- 4. Initial and Boundary Data
- 5. WRF/ARW Version 3.6 versus Version 3.4
- 6. Modification of lake surface (ice cover, skin temp)
- 7. Use of WRFDA to include local data (get started); Boulder workshop July 2014

OWLeS Integration Domain for SUNY Oswego WRF



Domain Configuration Experiments

- 1. Increase size of outer (12 km) domain
- 2. Increase size of inner (4 km) domain
- 3. Add third 1.333 km domain inside 4 km domain
- 4. Increase vertical resolution from 36 to 50 layers

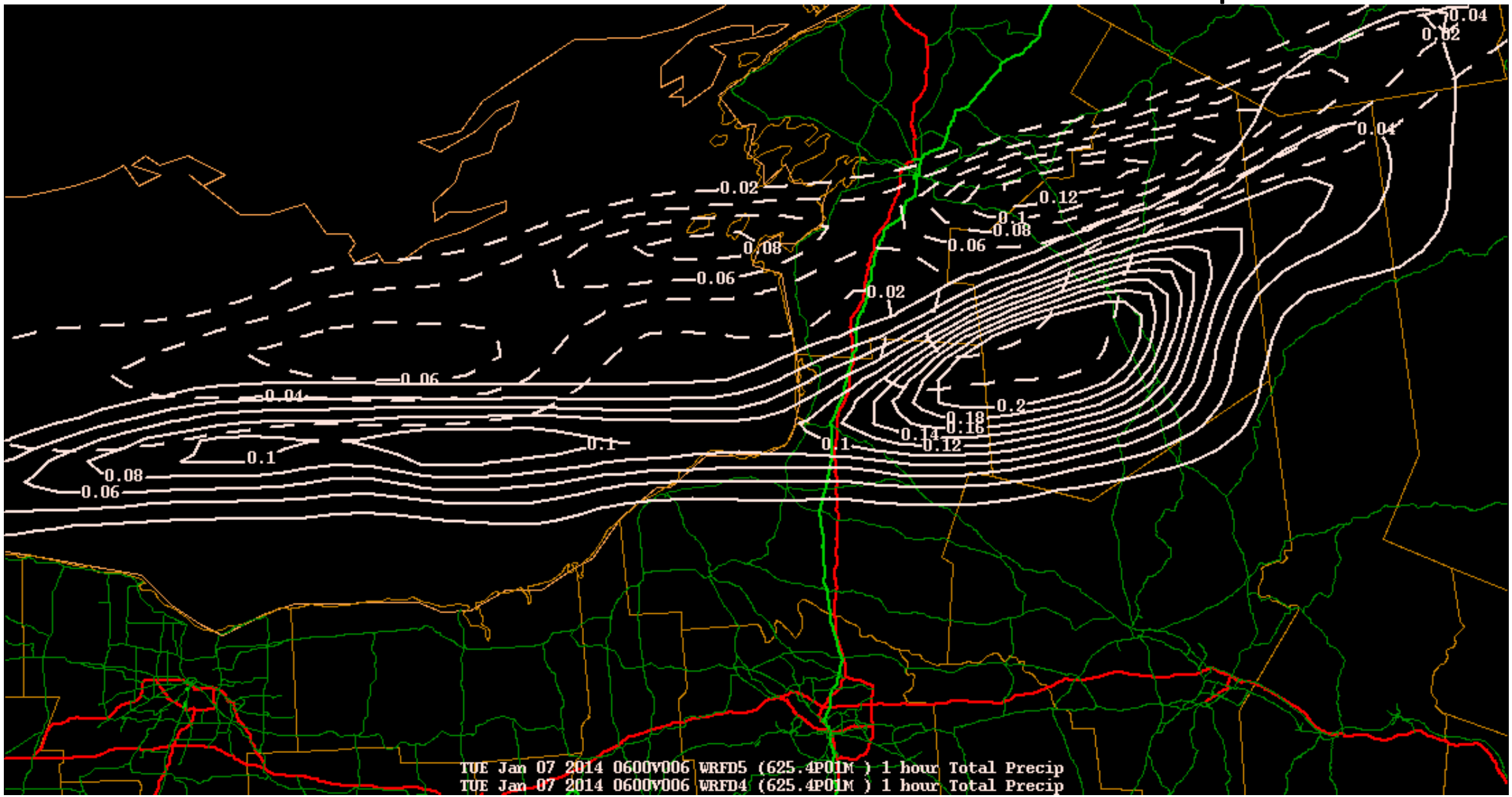
Test Physical Parameterizations

- 1. Test graupel options versus 3-phase scheme
- 2. Test use of shallow convection (shcu) option
- 3. Test PBL options versus YSU scheme
- 4. Test cumulus param. KF vs BM (outer grid only)

Initial and Boundary Data

- 1. NOMADS versus Tiles
- 2. NAM versus RAP and GFS
- 3. 1-hour update vs 3-hour update on outer domain
- 4. Accuracy of 00Z and 12Z vs 06Z and 18Z WRF runs

07 Jan 2014 F006 for NAM versus RAP Input Data



Methods

IOP 2 Date: 12/10/2013

TYX time of highest intensity near 21Z

TYX Longitude	TYX Latitude
-75.6	
-76.2	
-76.8	

WRF Version	Model Run Time	Model Latitude at -75.6 Longitude	Error	Model Latitude at -76.2 Longitude	Error	Model Latitude at -76.8 Longitude	Error	Average Error	Comment
3.4	12/10/2013 06Z								
	12/10/2013 12Z								
	12/10/2013 18Z								
	12/11/2013 00Z								
	12/11/2013 06Z								
	12/11/2013 12Z								
	12/11/2013 18Z								
3.6	12/10/2013 06Z								
	12/10/2013 12Z								
	12/10/2013 18Z								
	12/11/2013 00Z								
	12/11/2013 06Z								
	12/11/2013 12Z								
	12/11/2013 18Z								
Expanded 12km Domain	12/10/2013 06Z								
	12/10/2013 12Z								
	12/10/2013 18Z								
	12/11/2013 00Z								
	12/11/2013 06Z								
	12/11/2013 12Z								
	12/11/2013 18Z								
Expanded 4km Domain	12/10/2013 06Z								
	12/10/2013 12Z								
	12/10/2013 18Z								
	12/11/2013 00Z								
	12/11/2013 06Z								
	12/11/2013 12Z								
	12/11/2013 18Z								
	12/10/2013 06Z								
	12/10/2013 12Z								
	12/10/2013 18Z								

Domain | Physical | Initialization

The Effect of Ice Cover on the Ability of Forecasting Models to Simulate Lake-effect Snow Development

By: Tyler Kranz

Photo by Don Kranz, 29 Jan 2014

Research Goals

Problems with the NAM when dealing with ice cover:

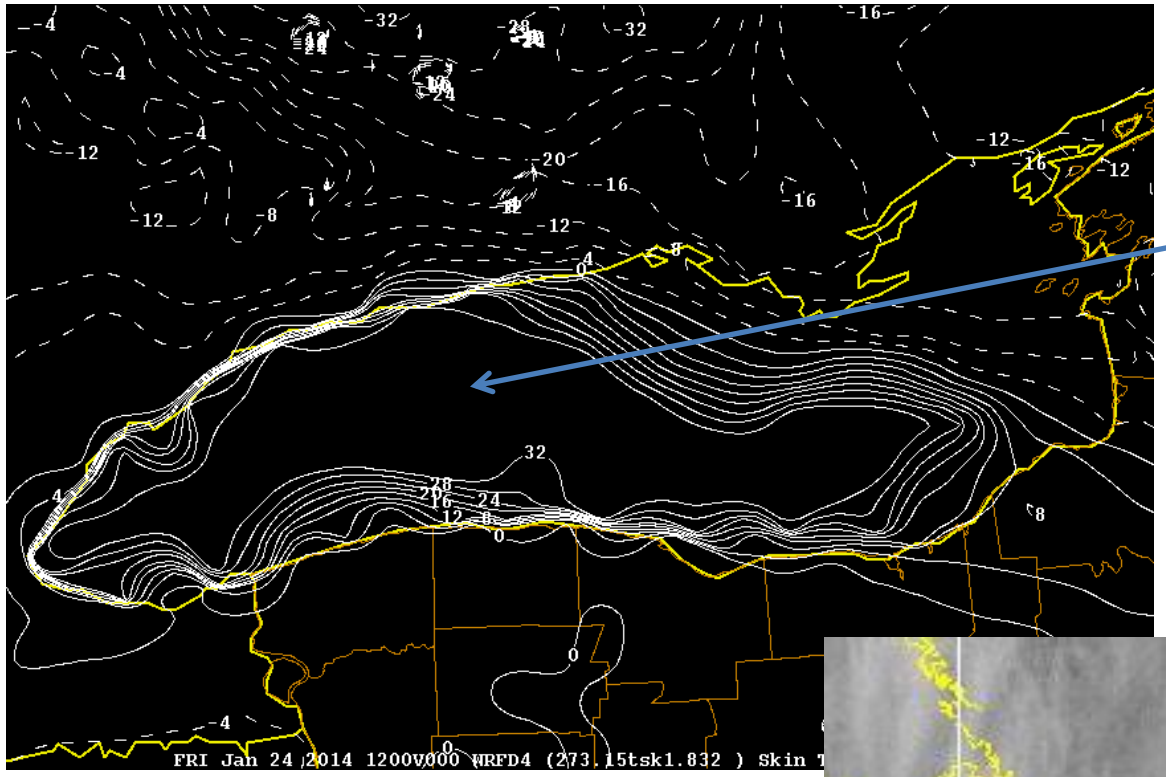
- The NAM's sea ice cover is taken from the NIC (http://www.natice.noaa.gov/) IMS product. Each grid box is an ice/no-ice mask, rather than a concentration field.

- When ice cover is present, this can become an issue for forecasting lake-effect snow development. The model overestimates the true ice cover conditions in some cases, hence limiting the ability to produce lake-effect snow. This can leave forecasters surprised when lake-effect snow does develop.

Our Goal:

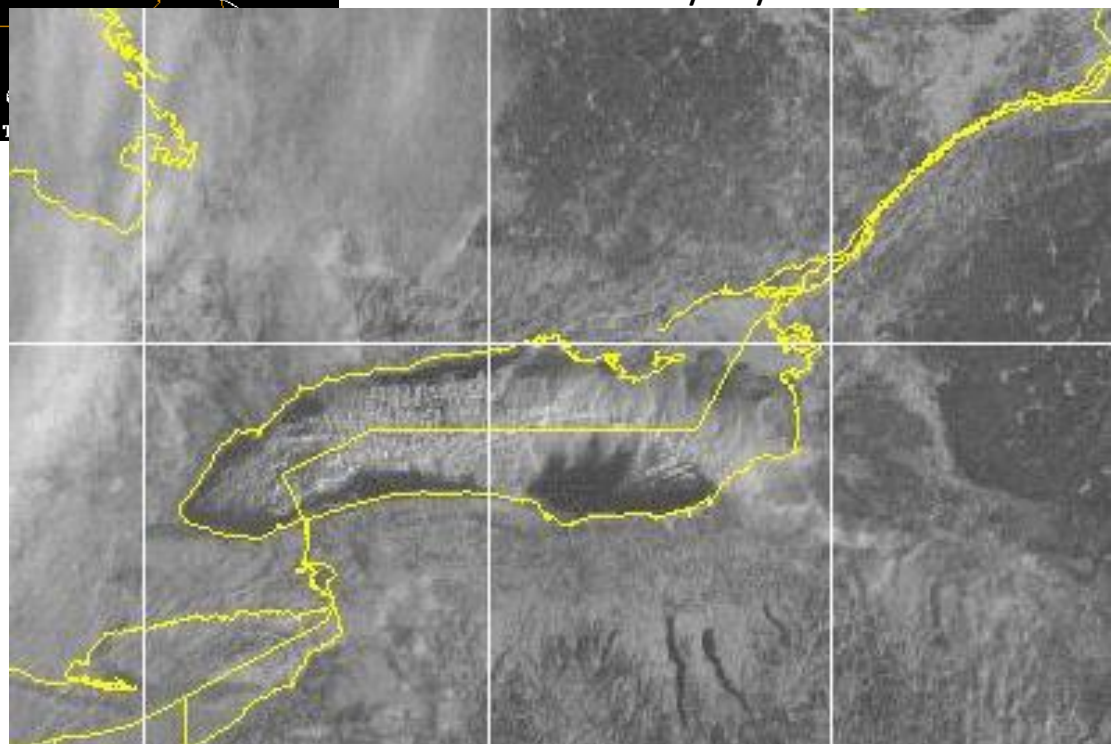
- To improve model simulations using the WRF v3.6. We want to initialize more accurate ice cover conditions into model runs in order to better simulate lake-effect snow formation and intensity (based on observational data). This will be conducted for **IOP 19** on 2014-01-24, initially.

Lake Ontario ‘Skin Temperature’ from NAM – Courtesy of Robert Ballentine



Region of open water. Everything outside the 32F degree contour is considered ice.

Goes-13 on 2014/01/24 at 13:25 UTC



Comparing the NAM’s ice cover conditions to the GOES-13 satellite imagery on 24 Jan shows the NAM was **overestimating** the ice cover conditions, thus limiting the model’s ability to simulate lake-effect snow development.

DATA AND METHODS

- When possible, use King Air data to obtain lake surface temperatures and the corresponding ice cover or open water (Meet with Geerts). GOES-13 satellite imagery (1 km resolution) can also be helpful in determining regions of ice cover. MODIS.

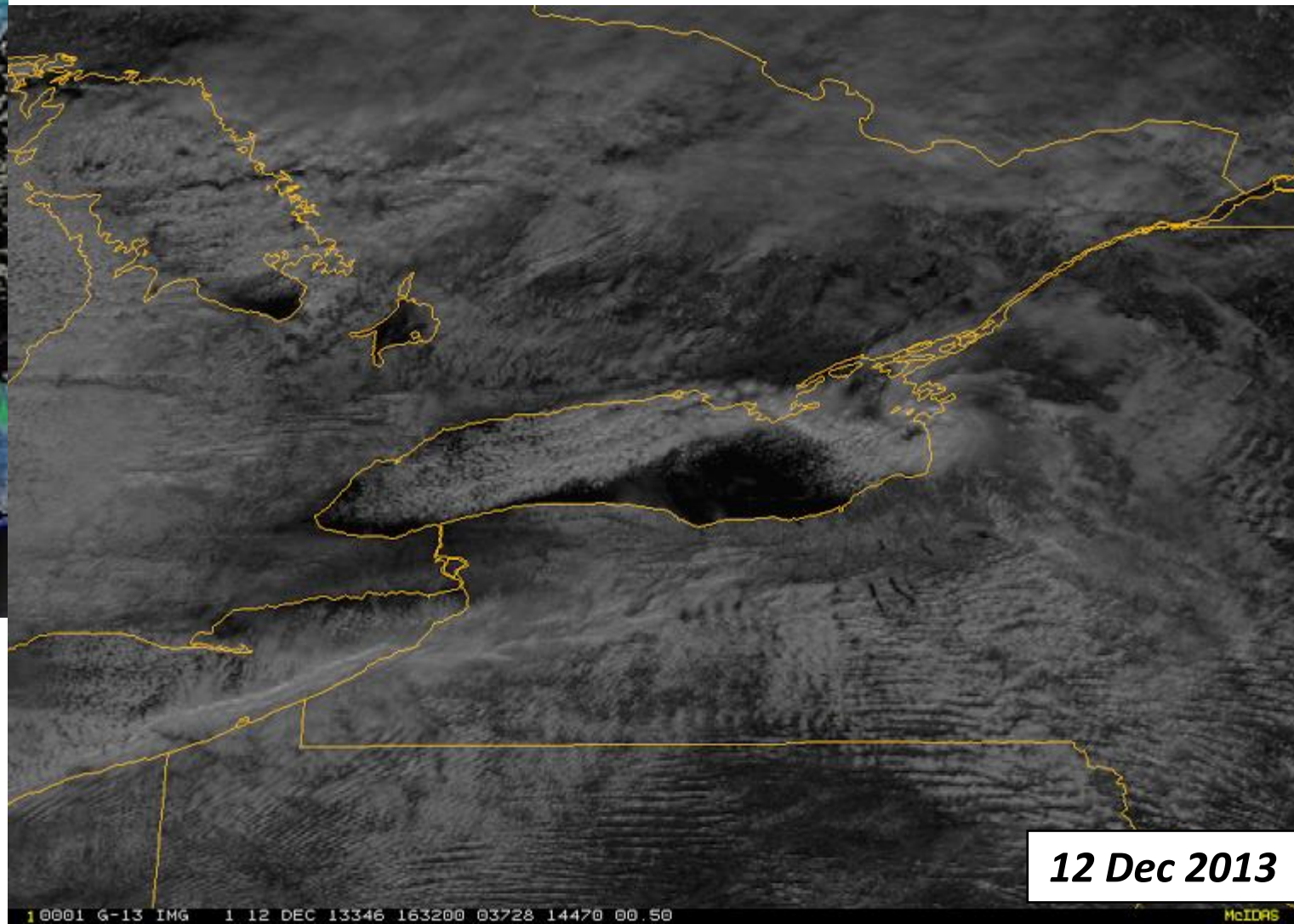
- Modify the output from metgrid (gives you initial data to run WRF from the NAM, interpolated to the horizontal grid boxes). We will focus on the surface values, which we would edit to what we think is more accurate based on observational data.

- Compare model runs with new initialization fields to observational data (e.g. radar reflectivity, surface observations) to determine if storms more accurately simulated.

Jake P. Mulholland
SUNY-Oswego

<u>Area of Study</u>: Miso/Meso-Vorticies and boundaries within Long Lake-Axis-Parallel (LLAP) Bands

18 Dec 2013



12 Dec 2013

OWLeS 2013-2014

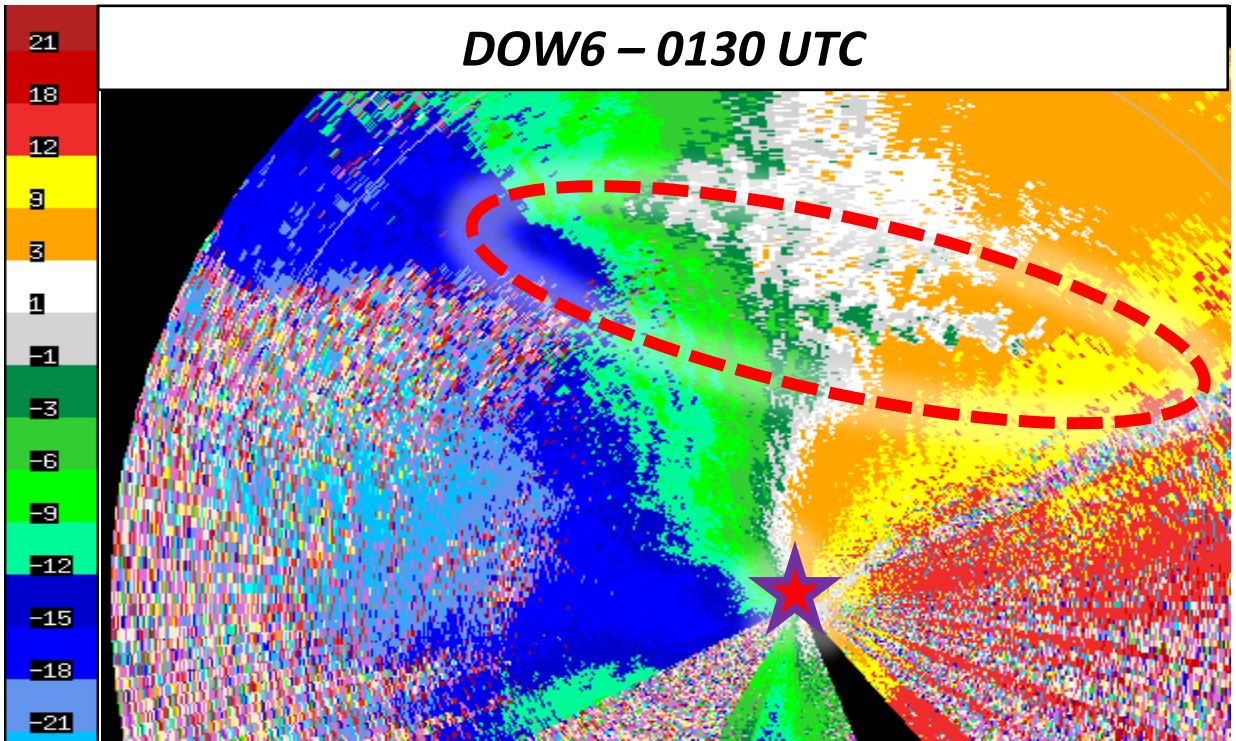
Possible Cases...

Other Cases –
*IOP#2b: 10-12 Dec 2013
*IOP#7: 6-7 Jan 2014

IOP#4: 15-16 Dec 2014

-LLAP band
-Many occurrences of miso-vorticies (40-4000m) and meso-vorticies (4-400km)

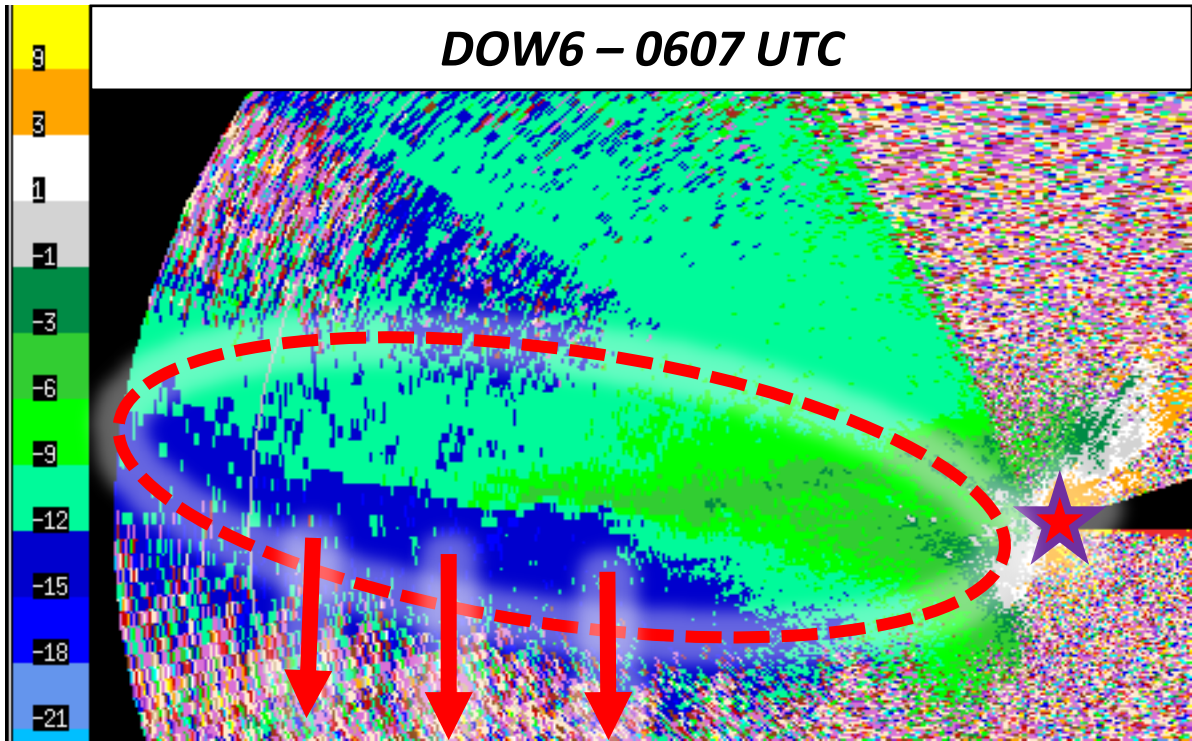
DOW6 – 0130 UTC



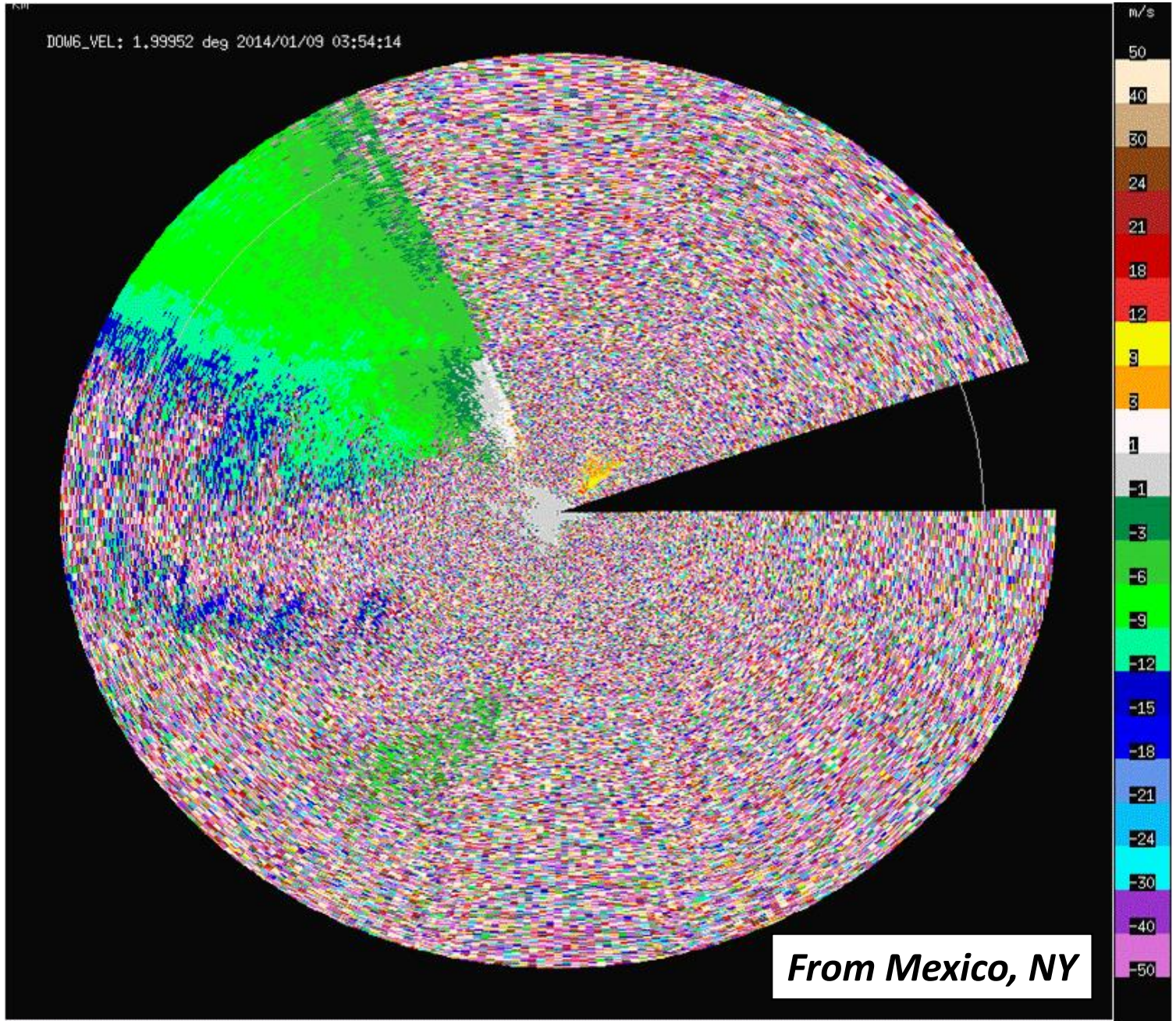
IOP#9: 9 Jan 2014

-LLAP band
-Shear Zone
-Possible outflow boundary

DOW6 – 0607 UTC



DOW6 – Velocity Loop from 04 UTC – 10 UTC on 9 Jan 2014



Radar Loop Courtesy:
Jordan Rabinowitz

Logistics …

Data and Methods

- DOW data (analyze using SOLO-III)
- KTYX | KBUF WSR-88D radar data
- UWKA data
- Soundings (mostly the ones OWLeS participants launched)
- Surface data (tornado pods??, snow teams, etc.)
- Mesonet data -- ????
- Model data -- ????

Goals

- Vorticity budget to determine if these miso/meso-vorticies are caused mainly by HSI ***or*** more so by tilting+stretching of horizontal vorticity (similar to supercells/tornadoes); work with CSWR
- Compare a case with many vorticies vs. a case with little/none; environmental differences
- Investigate hydrometeor type in and near miso/meso-vorticies
- Investigate the existence of boundaries (possibly outflow – IOP#9)