



ILLINOIS STATE
WATER SURVEY

PRAIRIE RESEARCH INSTITUTE

The Ontario Winter Lake-effect Systems (OWLeS) Project Influences of Upwind Lakes

David Kristovich, Luke Bard, Leslie Stoecker



University of Illinois at Urbana-Champaign

Recent Lake-Effect Field Projects

Univ. Chicago Lake Snow Project
Braham and Kelly (1982)
1970s and 1980s

Lake Ontario Winter Storms
Reinking et al. (1994)
1990

NWS Lake Effect Snow Study
e.g., Gurka (NWA, 1997)
Mid-1990s

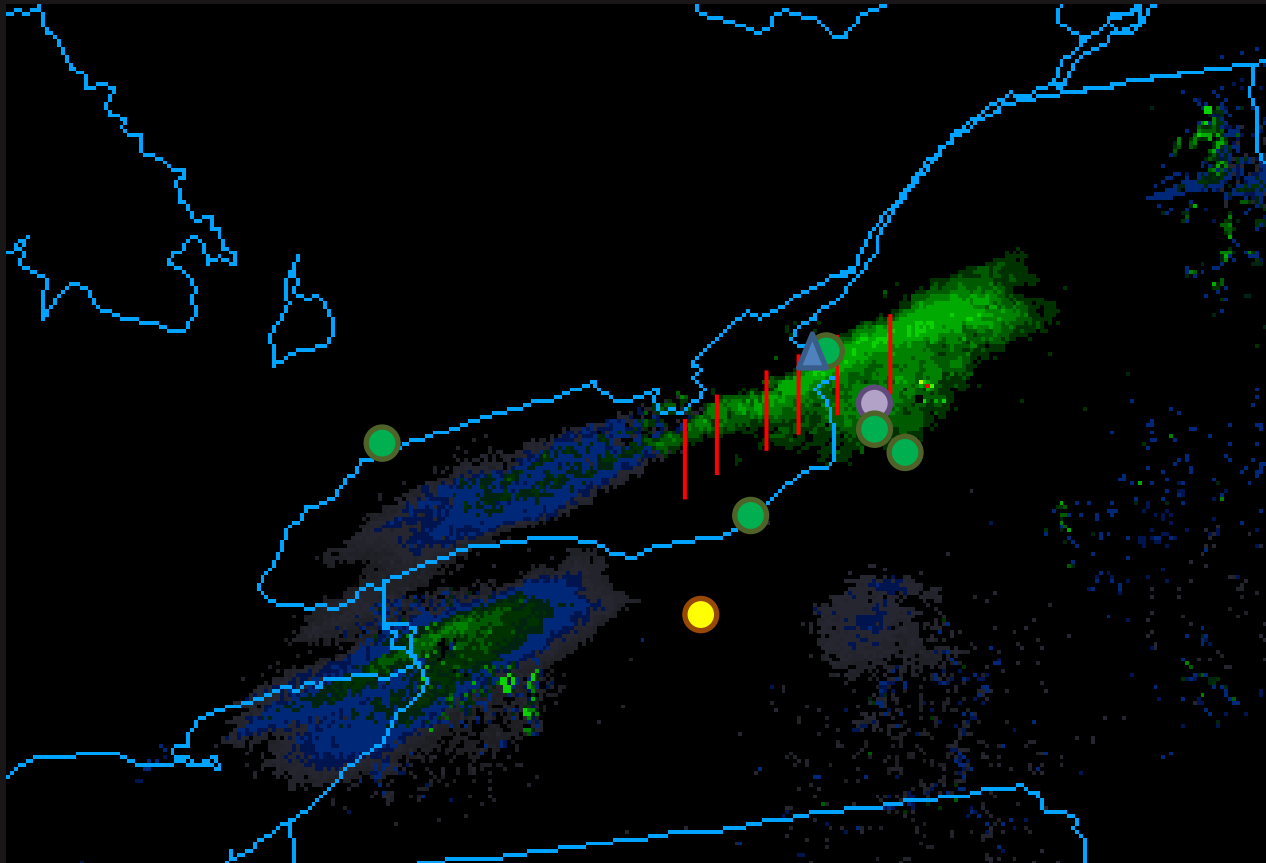
Lake-Induced Convection Experiment
Kristovich et al. (2000)
1997-1998

Great Lakes Ice Cover – Atmospheric Flux Experiment
Gerbush, Kristovich, Laird (2005)
2004

Long-Lake Axis Parallel
Steiger et al.
2010-2011



OWLeS – Ontario Winter Lake-effect Systems Field Efforts



OWLeS Principle Scientists

Millersville Univ.

Rich Clark
Todd Sikora

Univ. of Illinois

Jeff Frame
Dave Kristovich

Univ. of Wyoming

Bart Geerts

University of Alabama

Kevin Knupp

Ctr Severe Weather Research

Karen Kosiba
Josh Wurman

State Univ. of New York – Albany

Justin Minder

Univ. of Utah

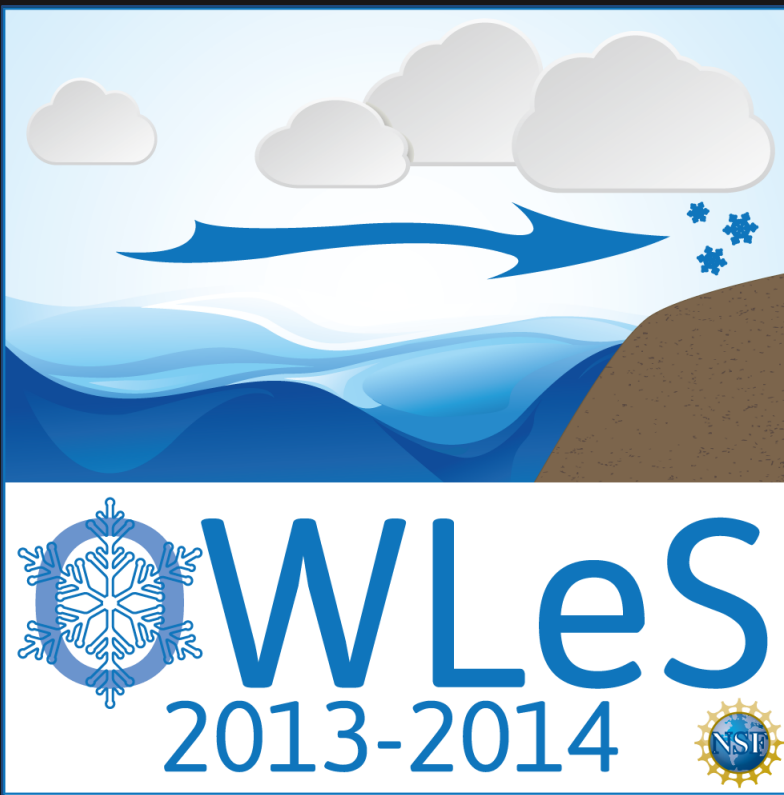
Jim Steenburgh

State Univ. of New York – Oswego

Scott Steiger

Pennsylvania State Univ.

George Young





OWLeS

2013-2014



Courtesy of Sharon Kristovich

Univ. Illinois Soundings

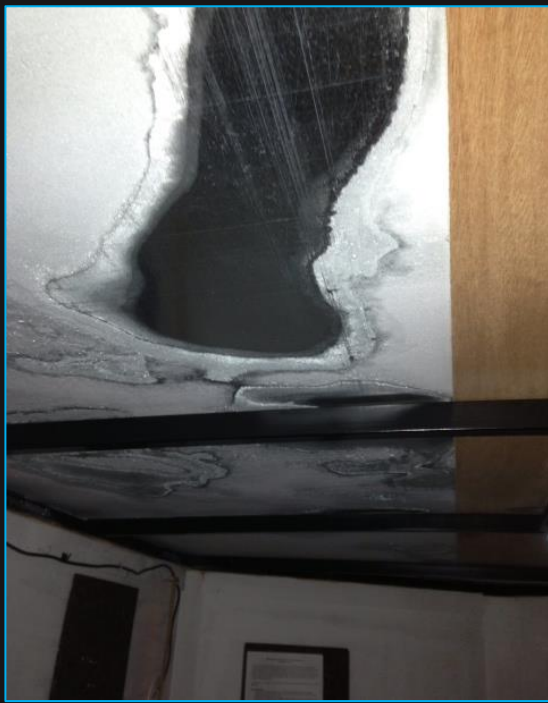


Photo by S. Kristovich

Luke Bard
Jason Keeler
David Kristovich
Sharon Kristovich

Jessica Olsen
Zachary Suriano
Sarah Trojaniak

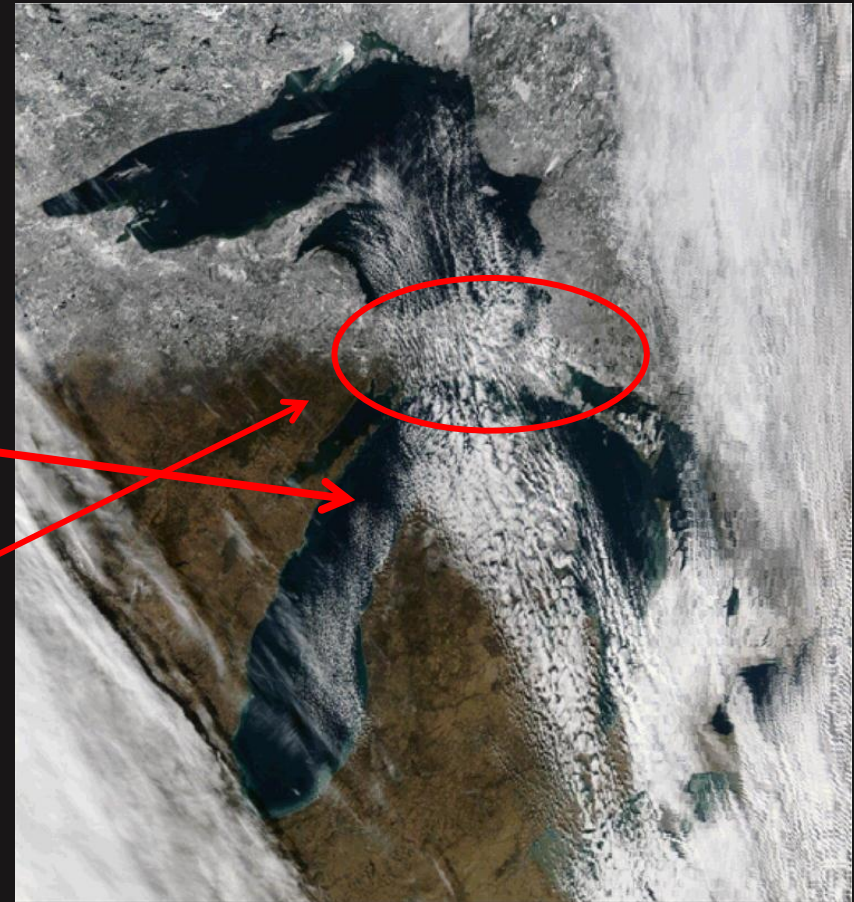
Univ. Illinois, Univ. Delaware, St. Louis Univ.,
SUNY-Oswego



Lake-to-Lake Lake-effect Cloud Bands

TWO FOCUS POINTS

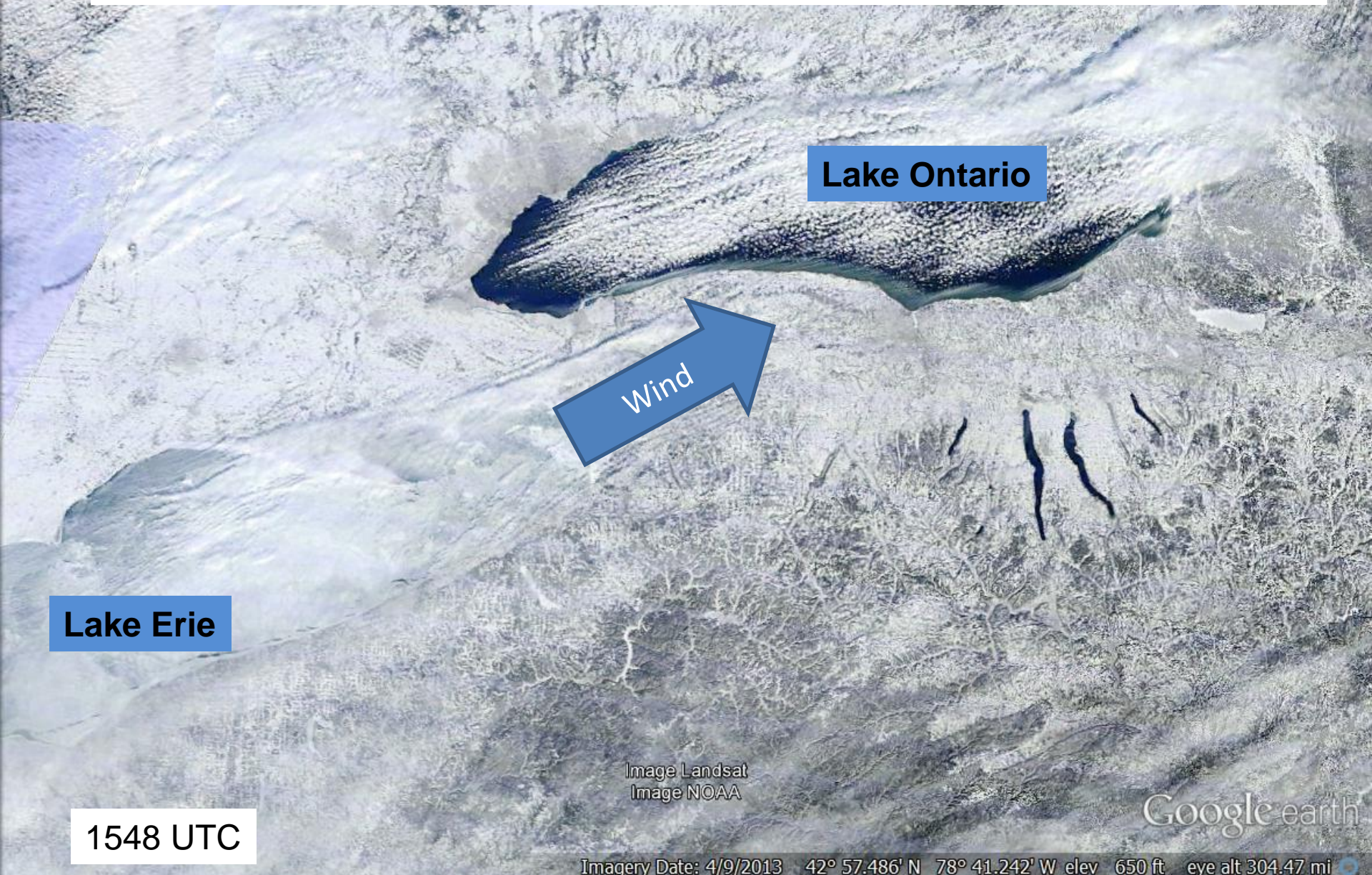
- ***What are the effects of upwind lakes?***
- ***Process by which the influence occurs***



Rodriguez, Kristovich, and Hjelmfelt (2007)



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Lake Ontario

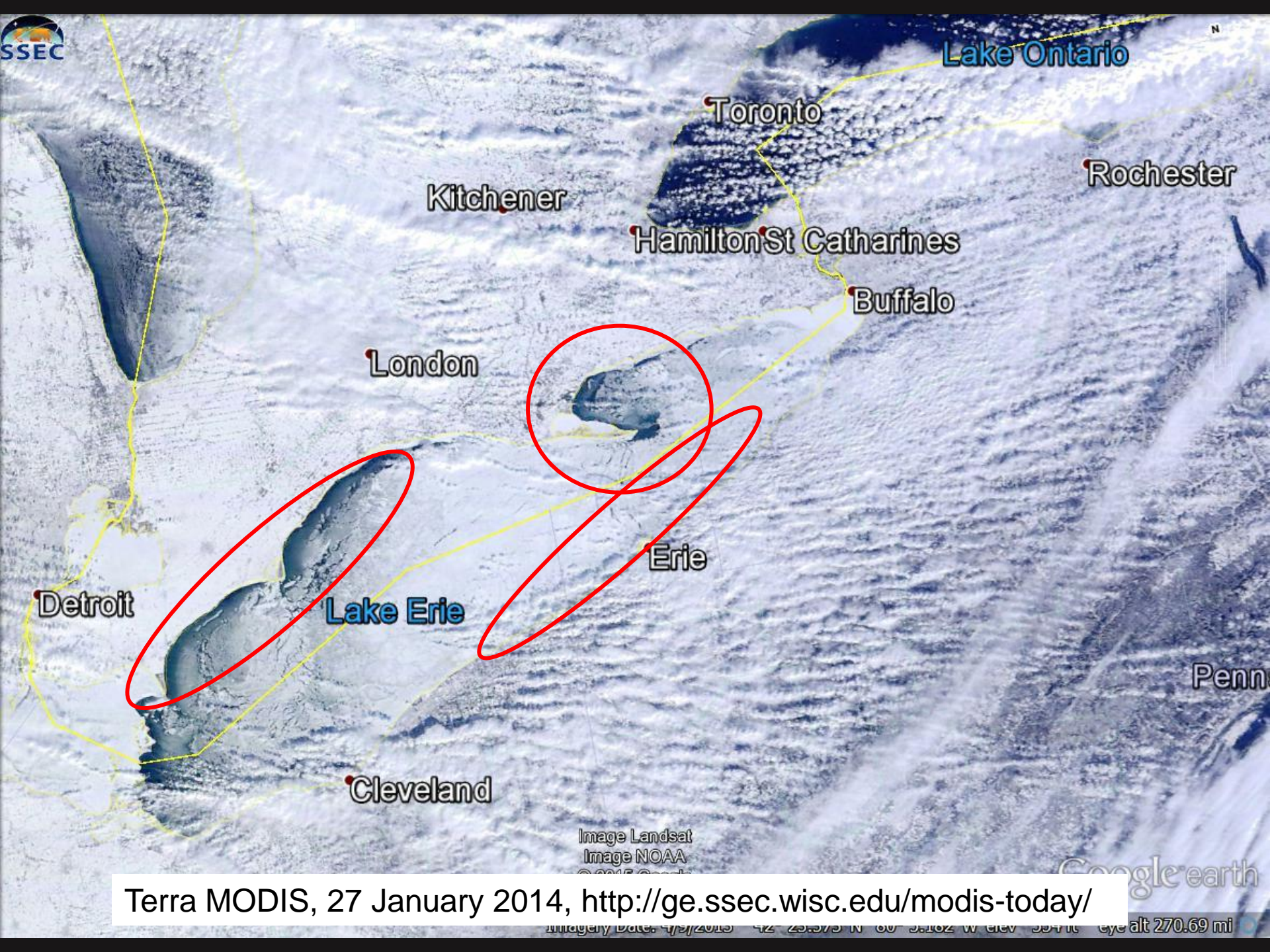
Wind

Lake Erie

1548 UTC

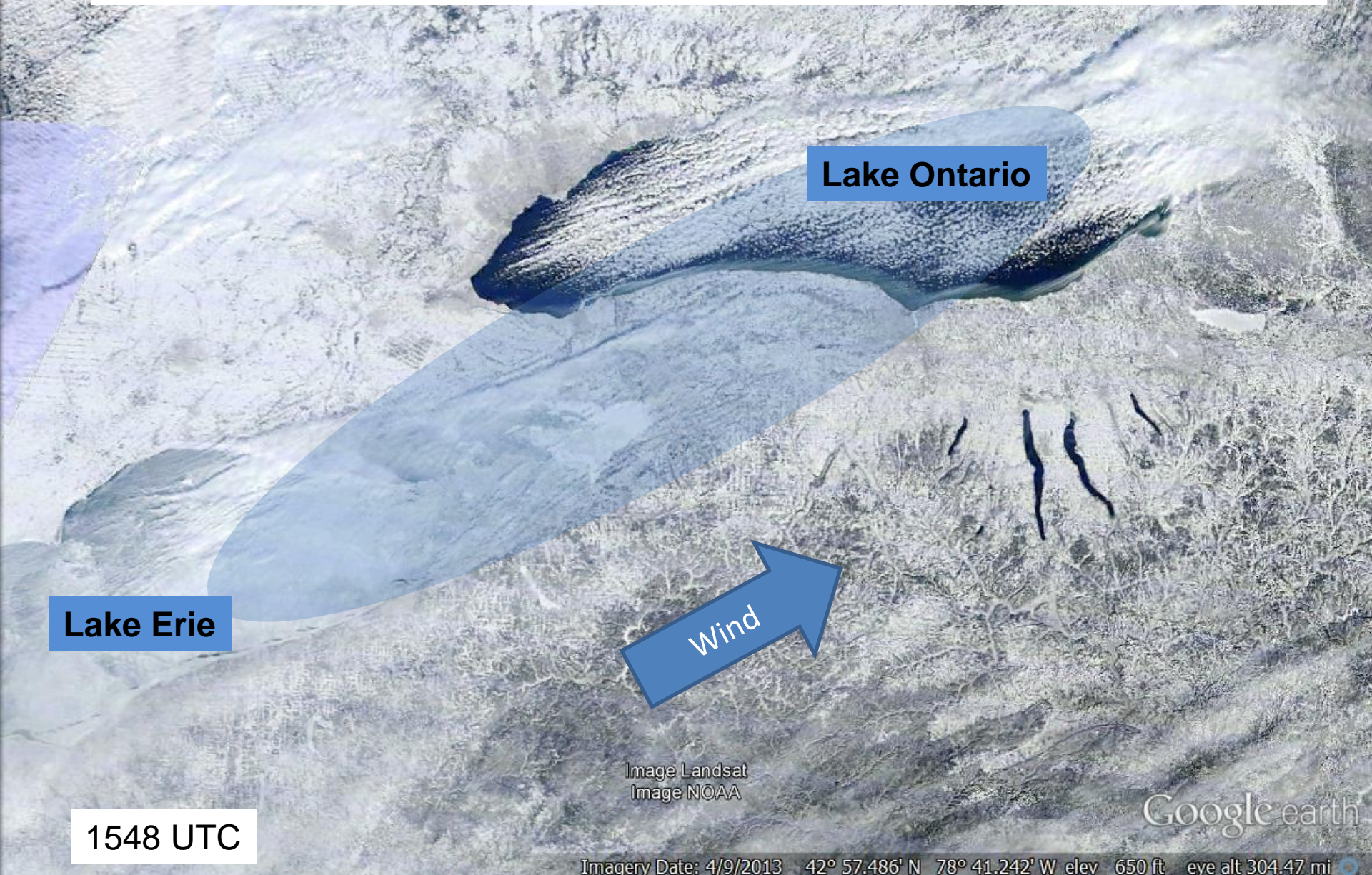
Image Landsat
Image NOAA

Google earth



Terra MODIS, 27 January 2014, <http://ge.ssec.wisc.edu/modis-today/>

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Lake Ontario

Lake Erie

Wind

Image Landsat
Image NOAA

Google earth

1548 UTC

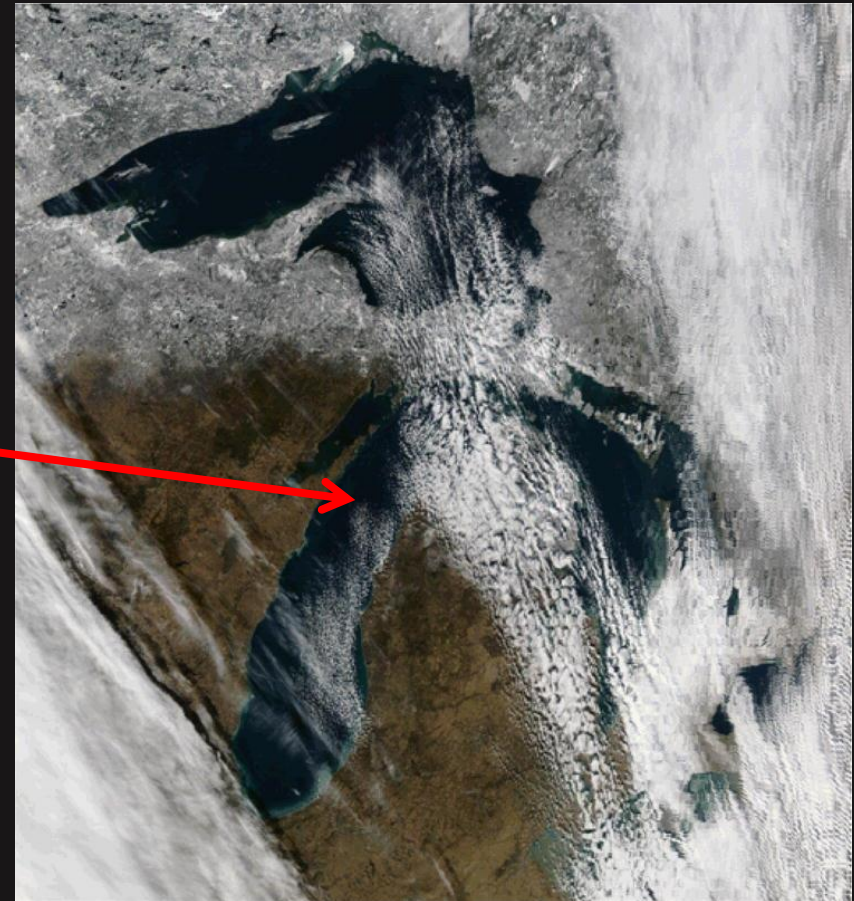
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Lake-to-Lake Lake-effect Cloud Bands

TWO FOCUS POINTS

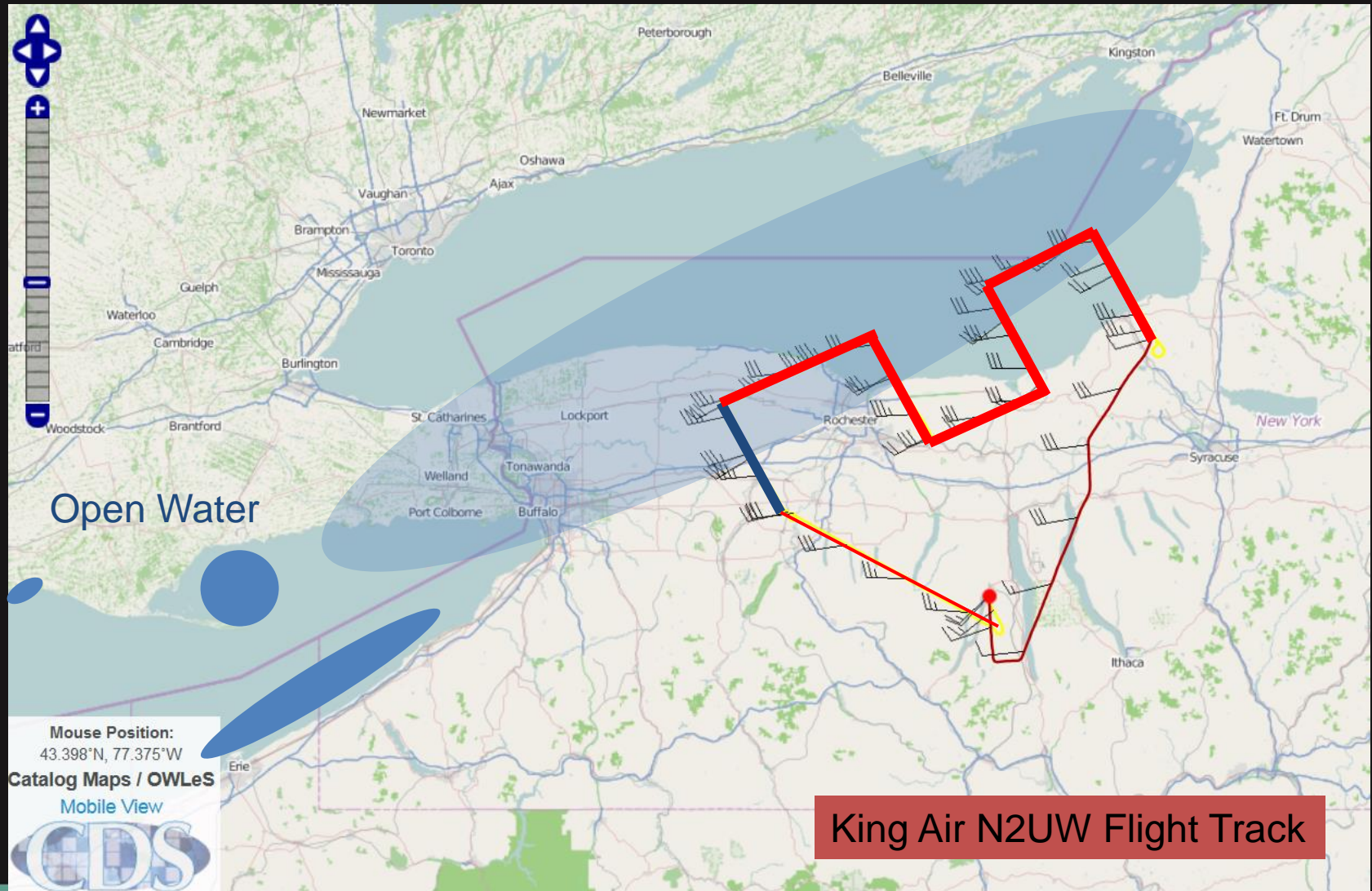
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Rodriguez, Kristovich, and Hjelmfelt (2007)



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20140128 175200.15



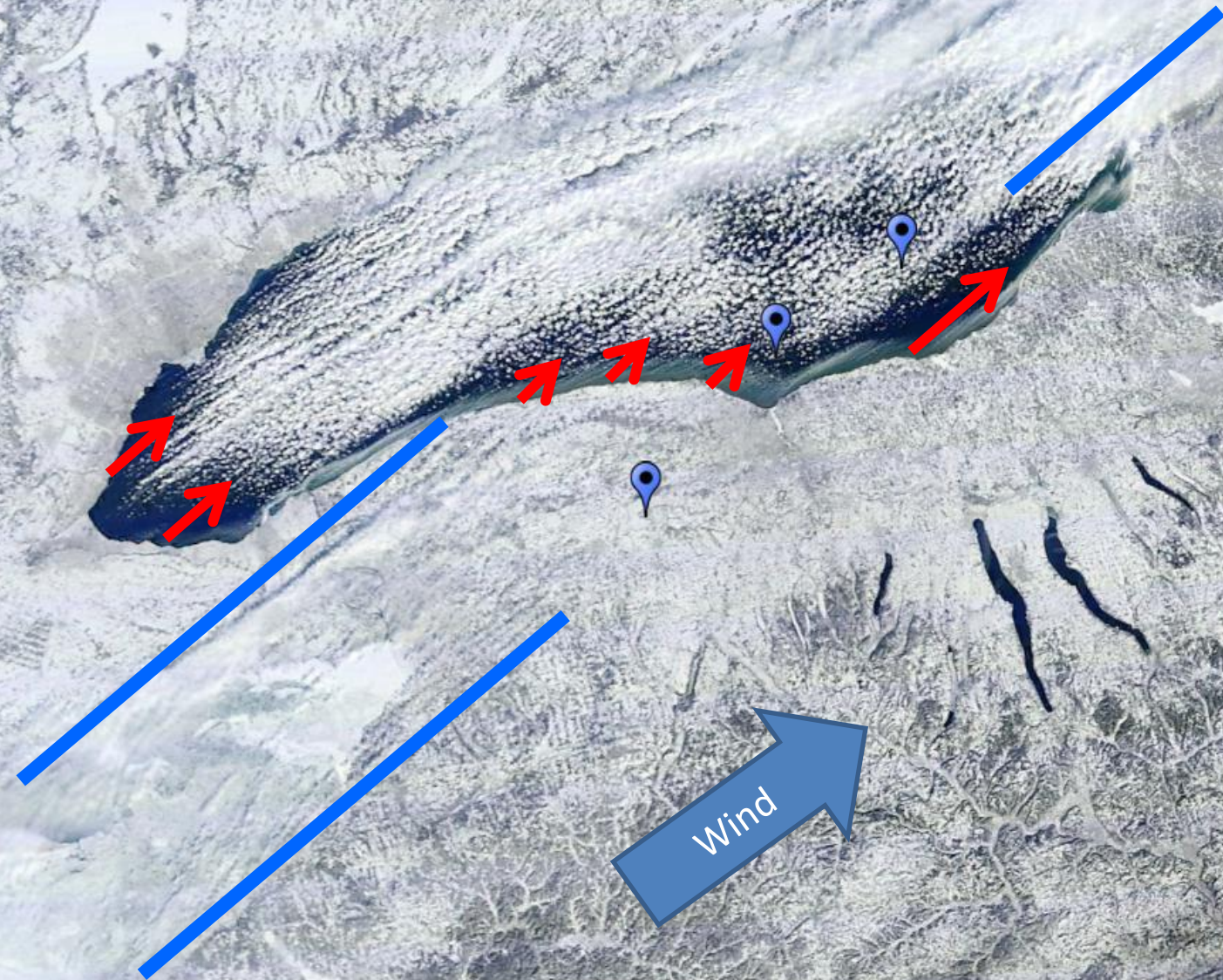
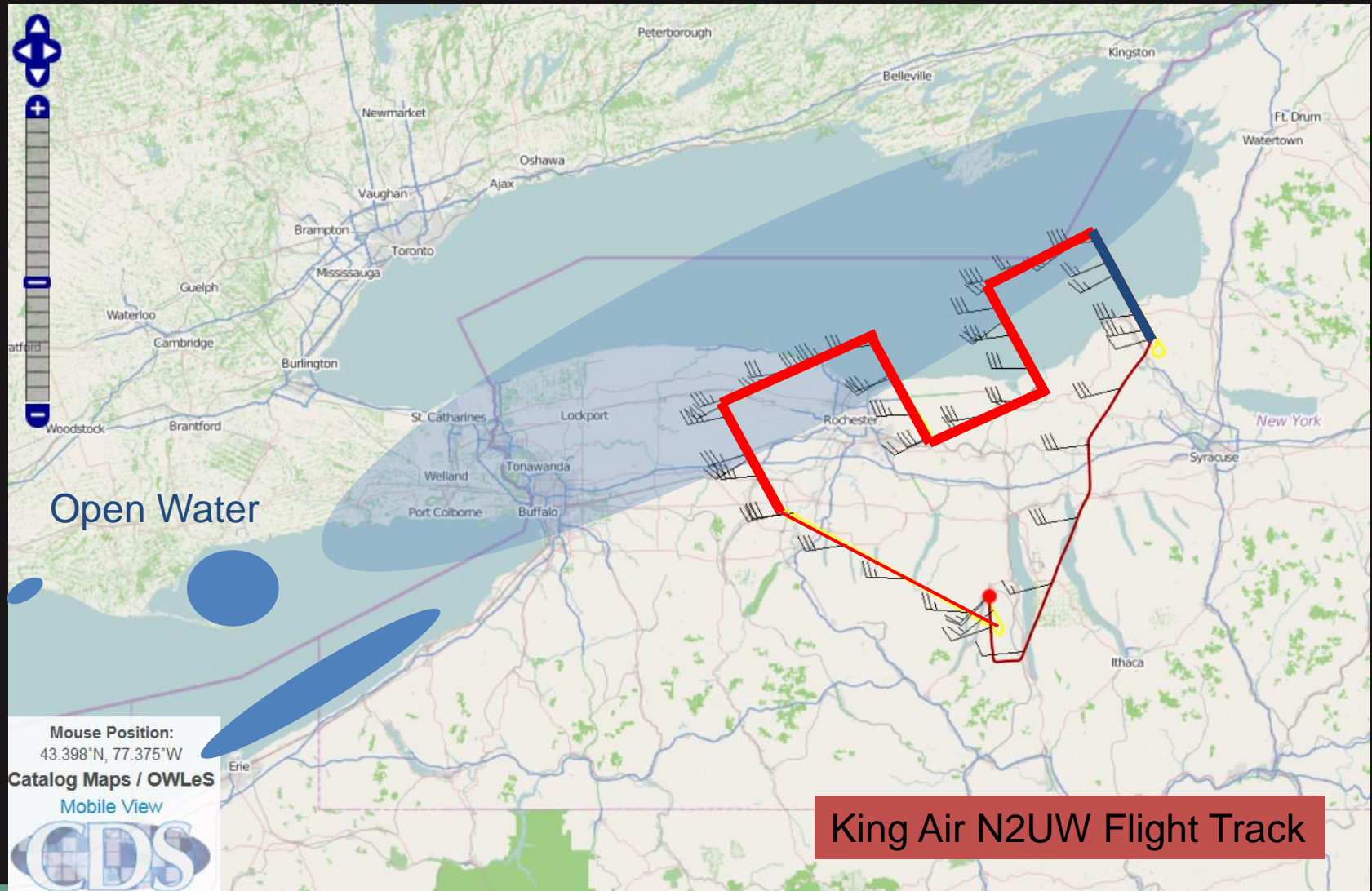


Image Landsat
Image NOAA

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N

18:35



18:40

Image NOAA

Image Landsat

Google earth

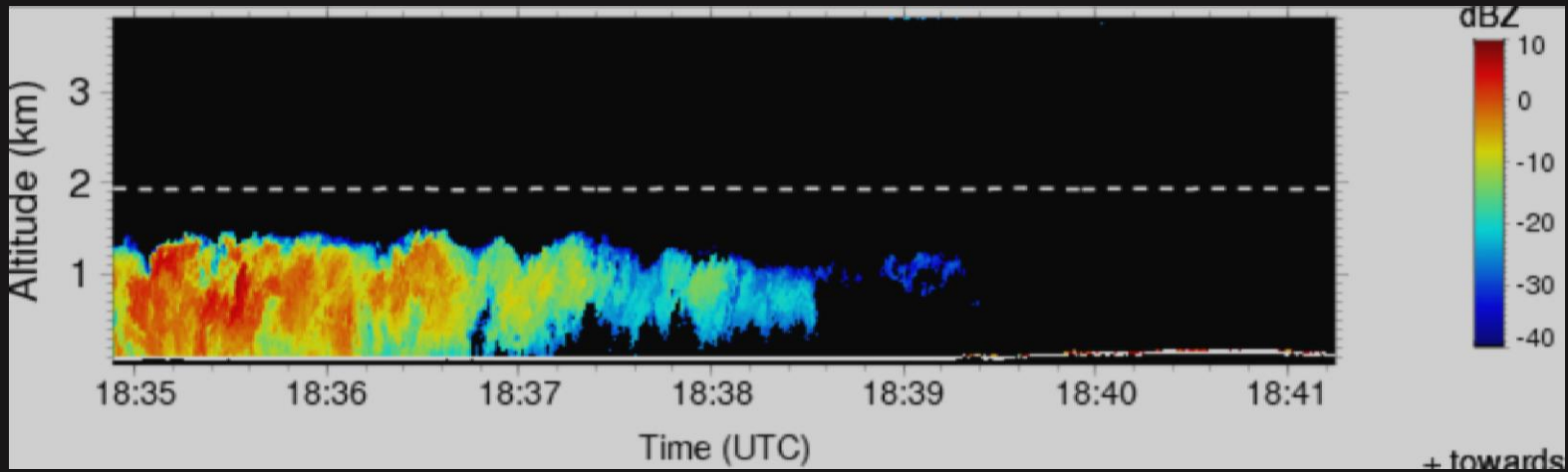
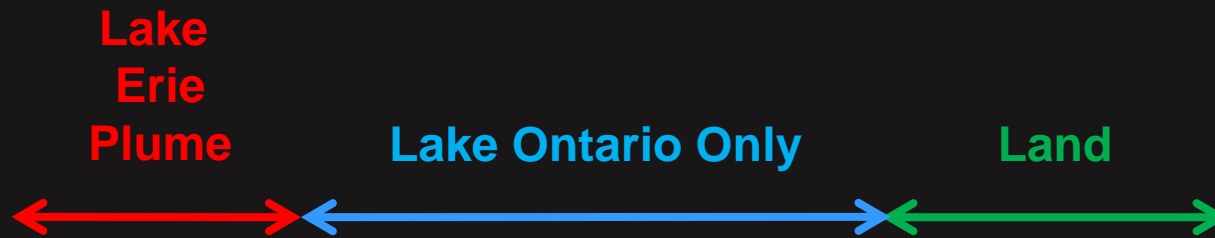
Imagery Date: 5/28/2015 43° 35.096' N 76° 31.693' W elev -242 ft eye alt 46.56 mi



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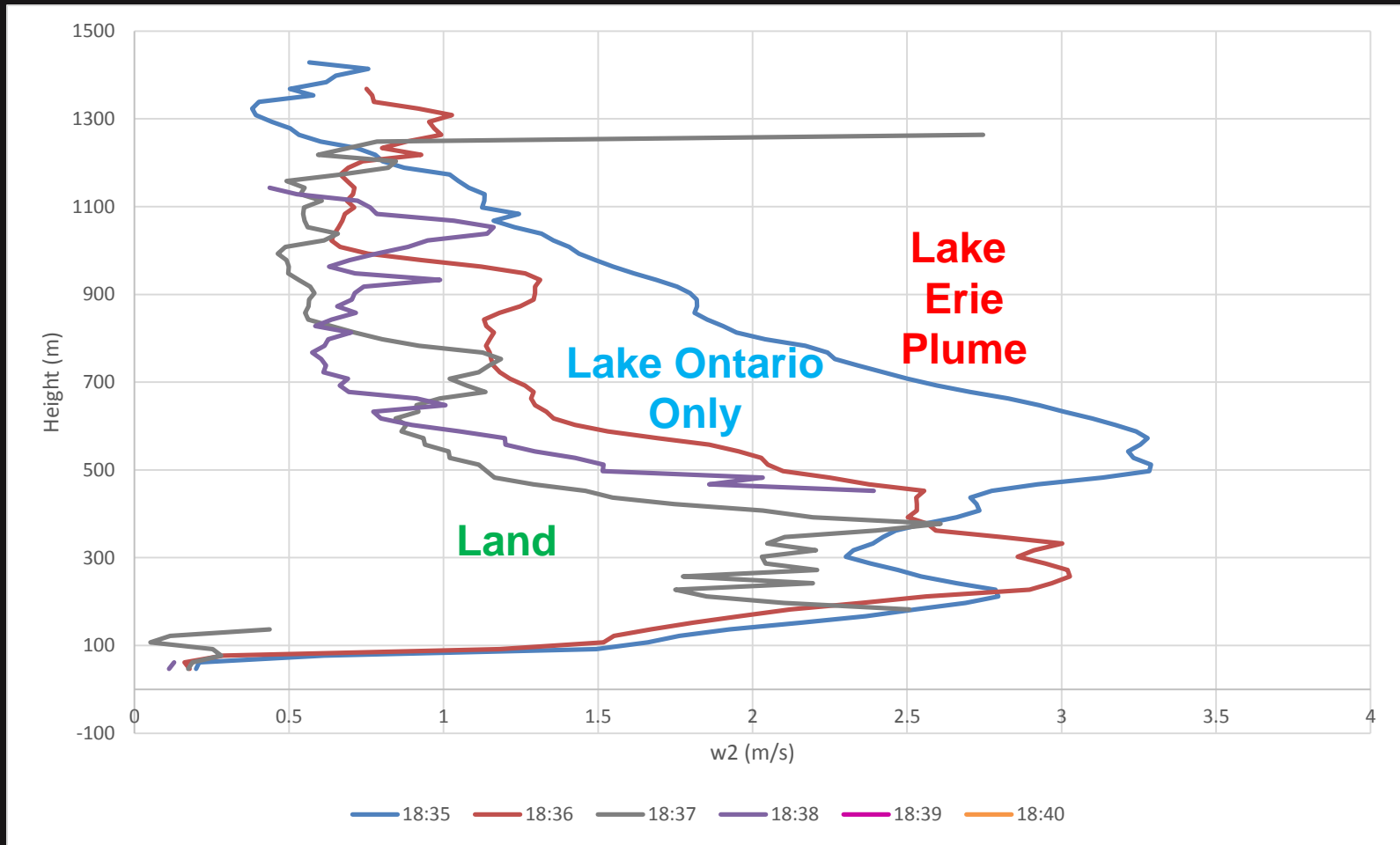
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WCR Radar Reflectivity (dBZ)



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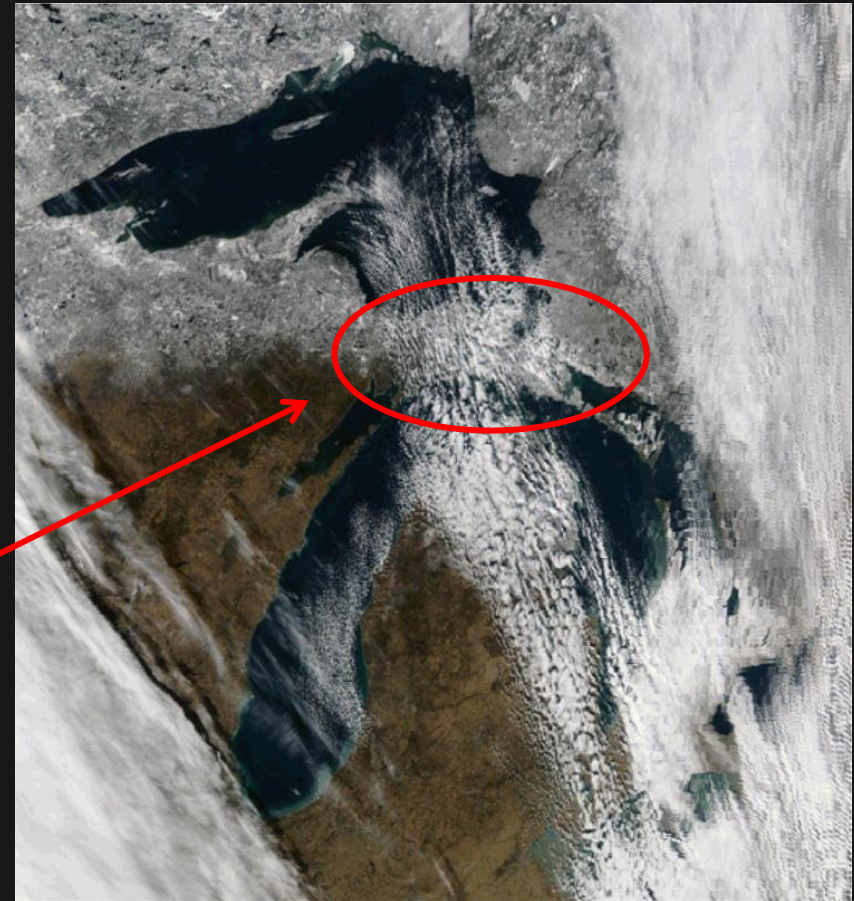
$(WCR \text{ vertical velocity})^2 \text{ (m}^2/\text{s}^2)$



Lake-to-Lake Lake-effect Cloud Bands

TWO FOCUS POINTS

- ***What are the effects of upwind lakes?***
- ***Process by which the influence occurs***

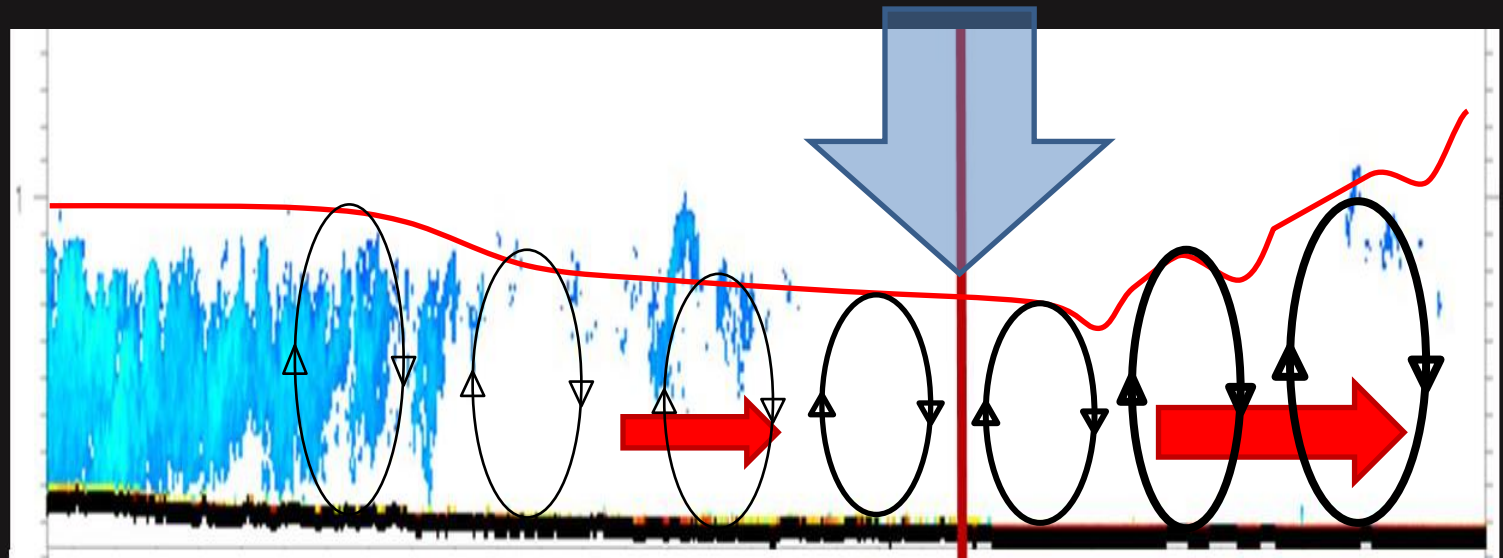


Rodriguez, Kristovich, and Hjelmfelt (2007)



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Leg 2: 18:00:05-
18:06:51



Land

Ice

Water



Summary and Findings

- Plume of air modified by Lake Erie
- Observed Influences of Plume
 - Clouds formed more quickly
 - Increased snowfall rate
 - Increased vertical mixing
- Subsidence near shoreline
- Influences
 - Reduced upwind stability
 - Cloud-scale circulations
 - Potential Seeding



Acknowledgements

- OWLeS Pis and participants
- UWKA pilots, crew and project managers!
- NWS Support
- Bart Geerts, Sam Haimov (U. Wyo)
- National Science Foundation, Physical and Dynamic Meteorology Prog., AGS 12-59004
- University of Illinois Sounding Team



Look for our article in BAMS!



Courtesy of Bart Geerts



Summary and Findings

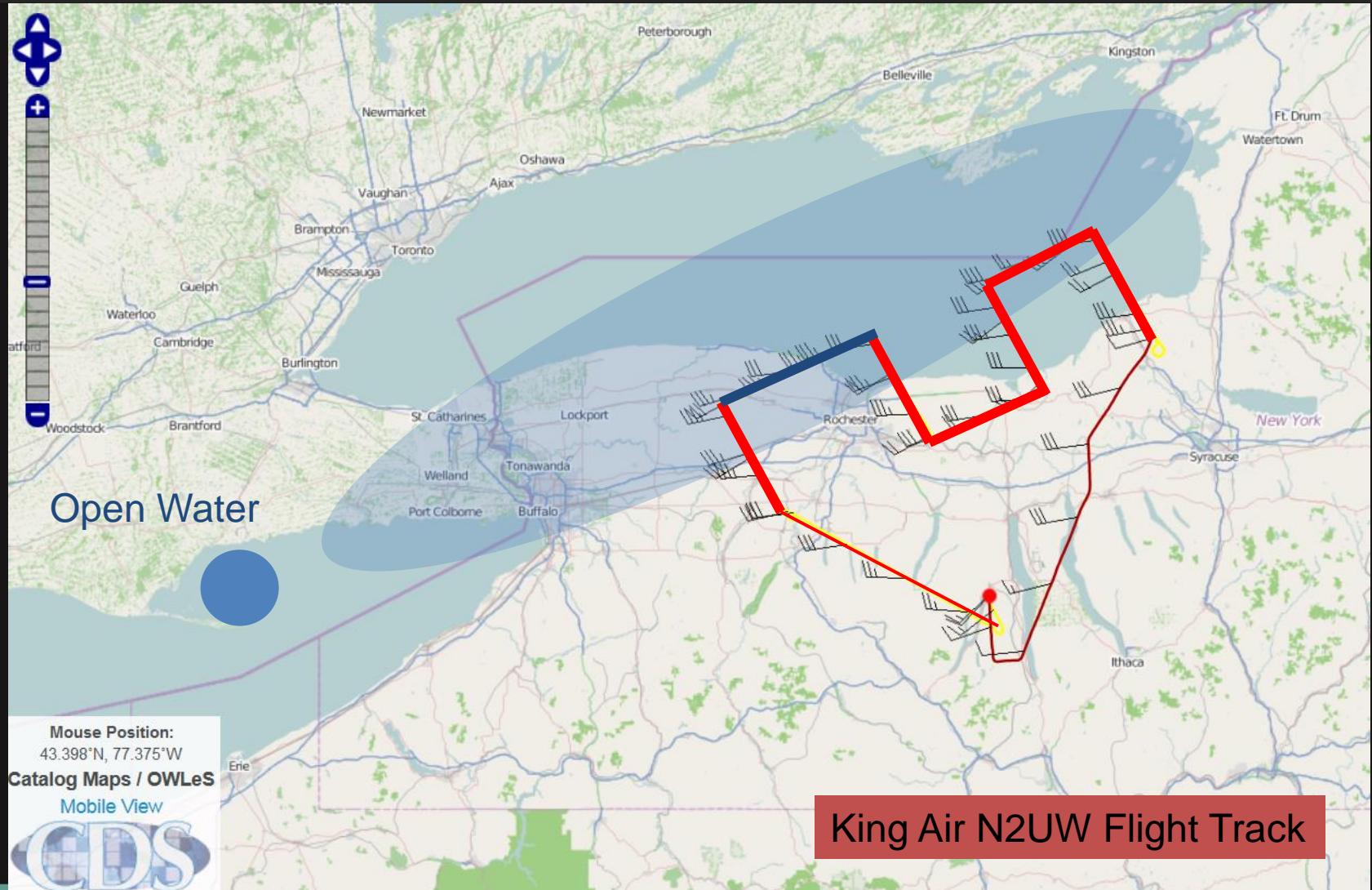
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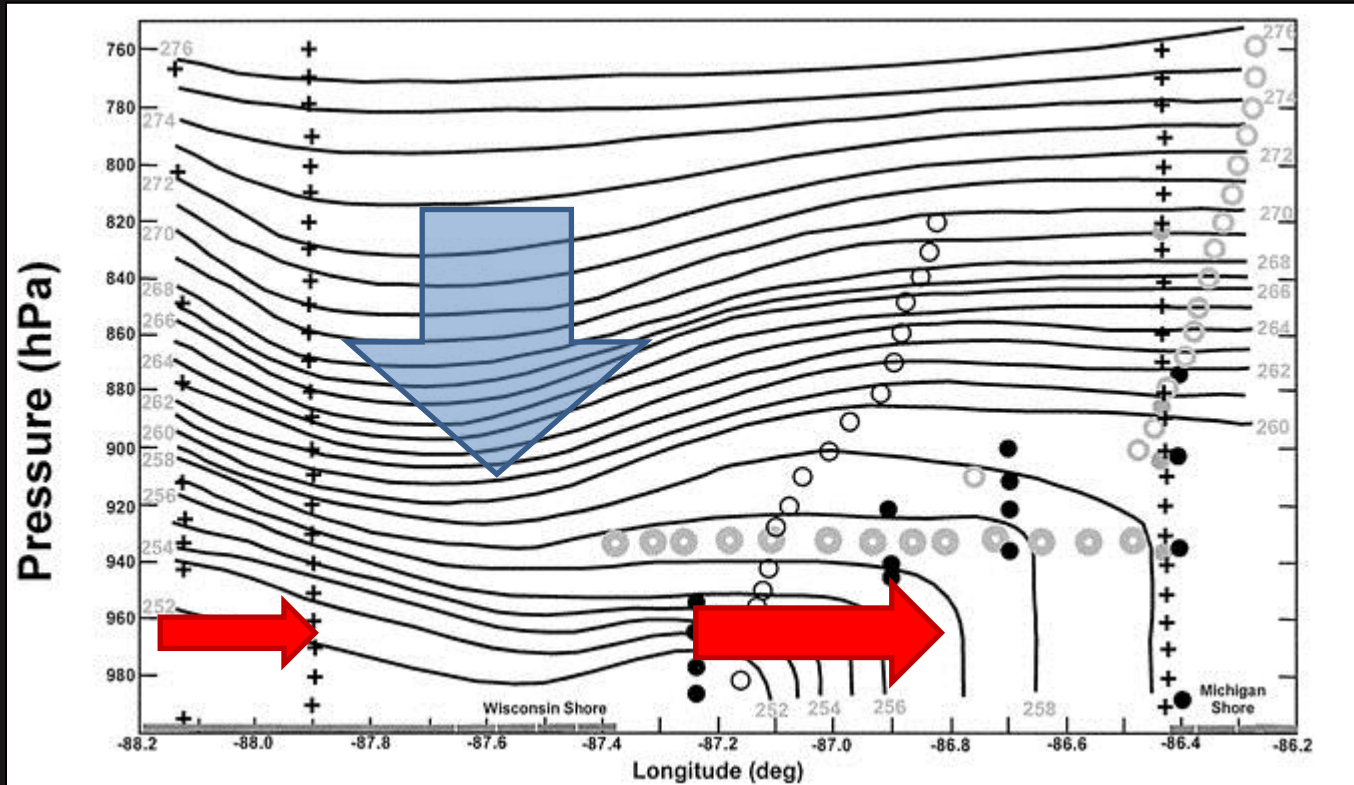
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Mark Kulie, Univ. Wisc., <http://ge.ssec.wisc.edu/modis-today/>

Spatial Evolution of Lake-effect Snow

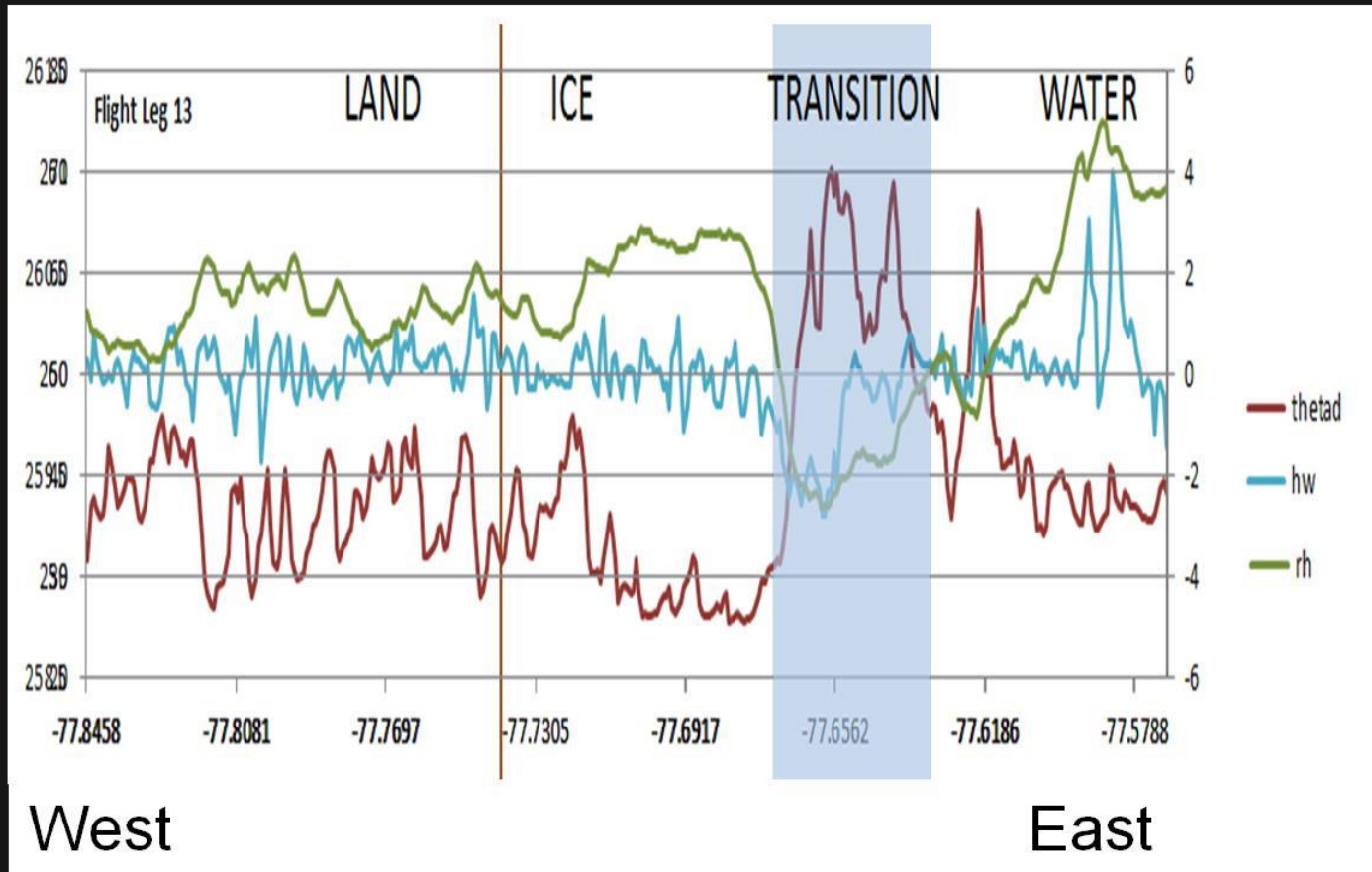
13 Jan 1998



Kristovich, David A. R., Neil F. Laird, Mark R. Hjelmfelt, 2003: Convective Evolution across Lake Michigan during a Widespread Lake-Effect Snow Event. *Mon. Wea. Rev.*, **131**, 643–655.



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Flight Leg 13, Flight Stack B, 818 m AGL average



1806 UTC

Shoreline

Leg 2: 18:00:05-
18:06:51

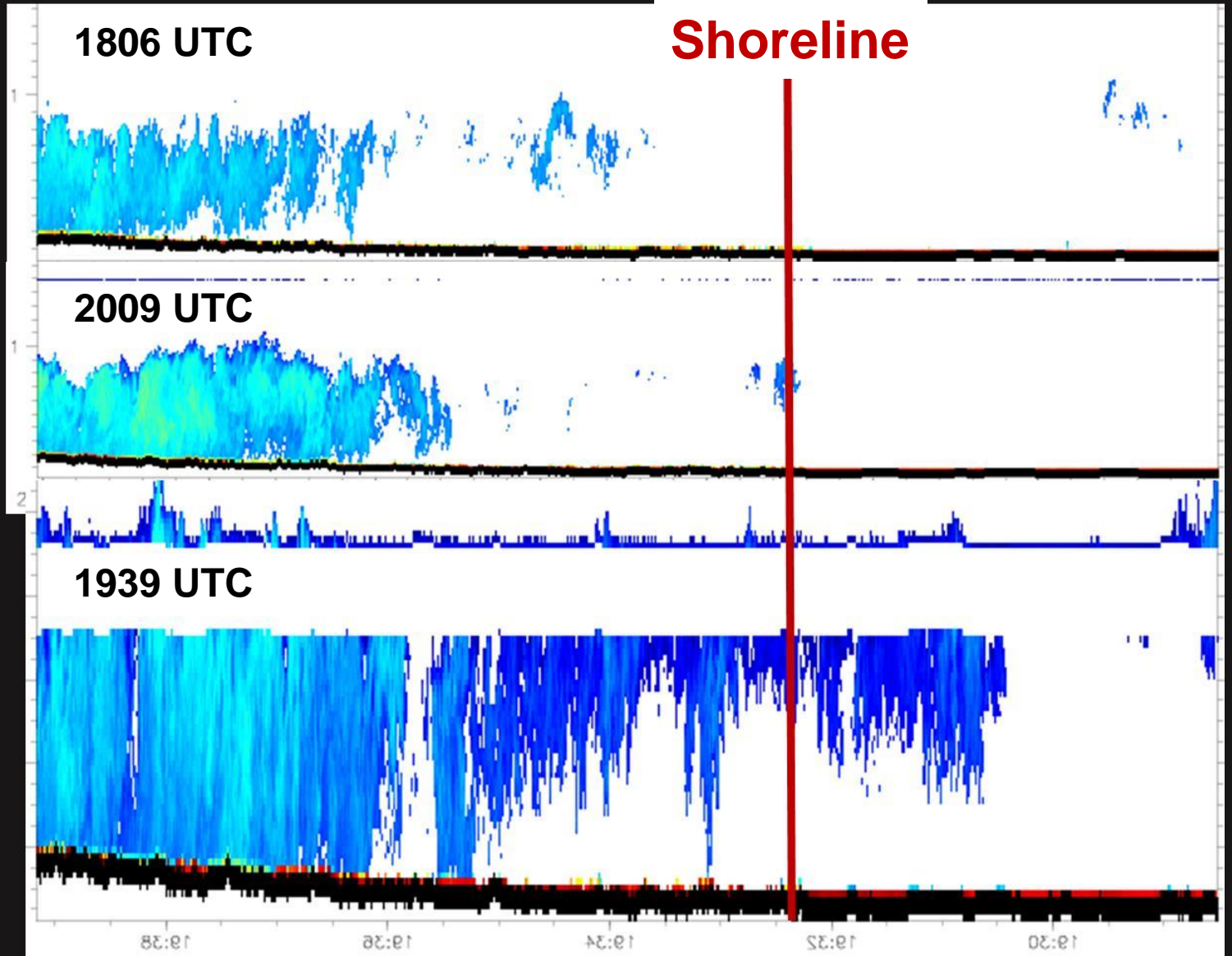
2009 UTC

Leg 16: 20:01:58-
20:09:05

1939 UTC

Leg 13: 19:28:31-
19:39:10

The red line
indicates the
shore line



19:28

19:29

19:30

19:31

19:32

Land

Ice

Water



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Locations of vertically-consistent updrafts

U
P
D
R
A
F
T
S

