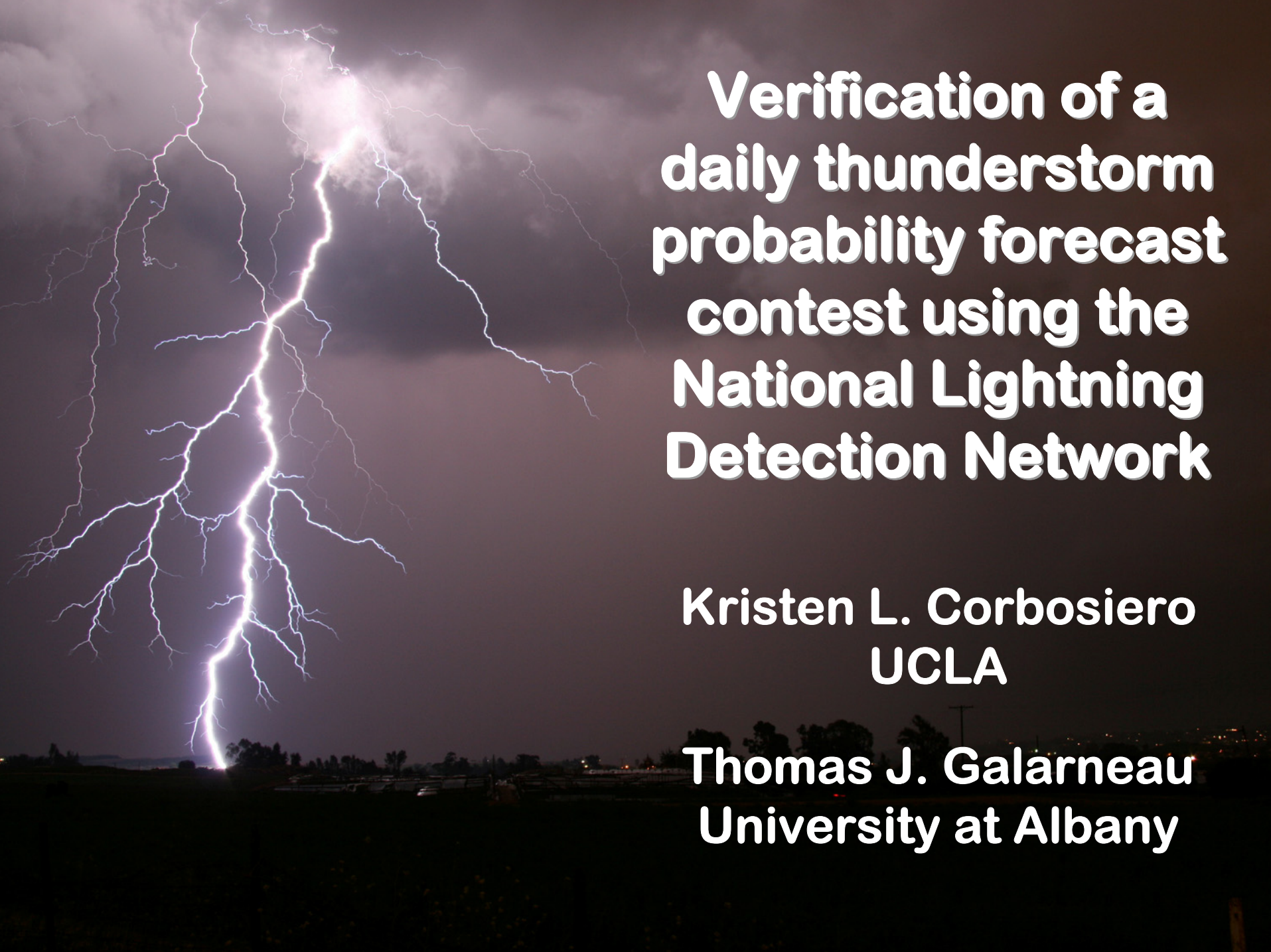


Verification of a daily thunderstorm probability forecast contest using the National Lightning Detection Network

Kristen L. Corbosiero
UCLA

Thomas J. Galarneau
University at Albany

Introduction and Motivation

- Since 1983, a thunderstorm probability forecast contest has been organized by the University at Albany during the months of June, July, and August

- The contest involves predicting the probability to the nearest 10% that a thunderstorm will be reported during a 24 hr period (starting @ 18 UTC) at ten locations across the continental United States

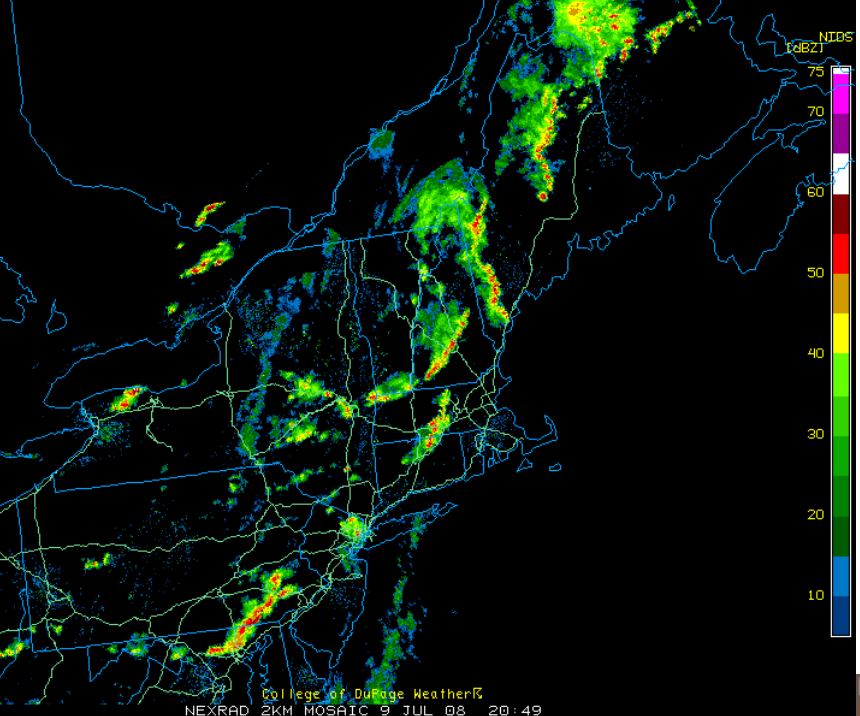
- The forecasts are verified by standard ASOS reports and are scored against consensus and a 16 year thunderstorm climatology (1988–2003)

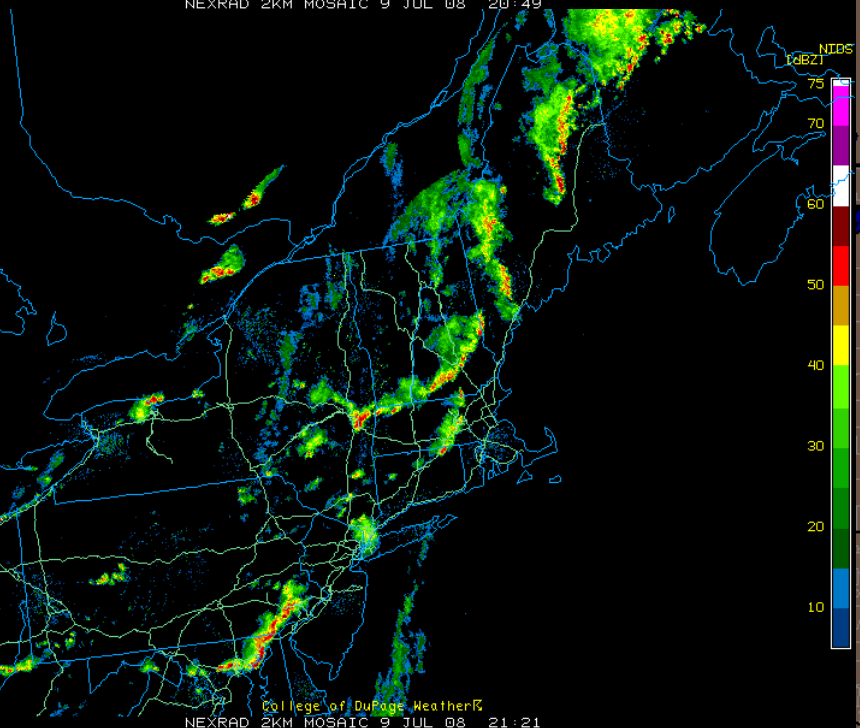
Introduction and Motivation

- In recent years however, there have been several instances, particularly during overnight hours, in which a thunderstorm failed to be reported by the ASOS despite its occurrence

- During such instances, the forecast contest was verified by contacting the attendant NWS office directly and/or examining WSR-88D and National Lightning Detection Network (NLDN) data

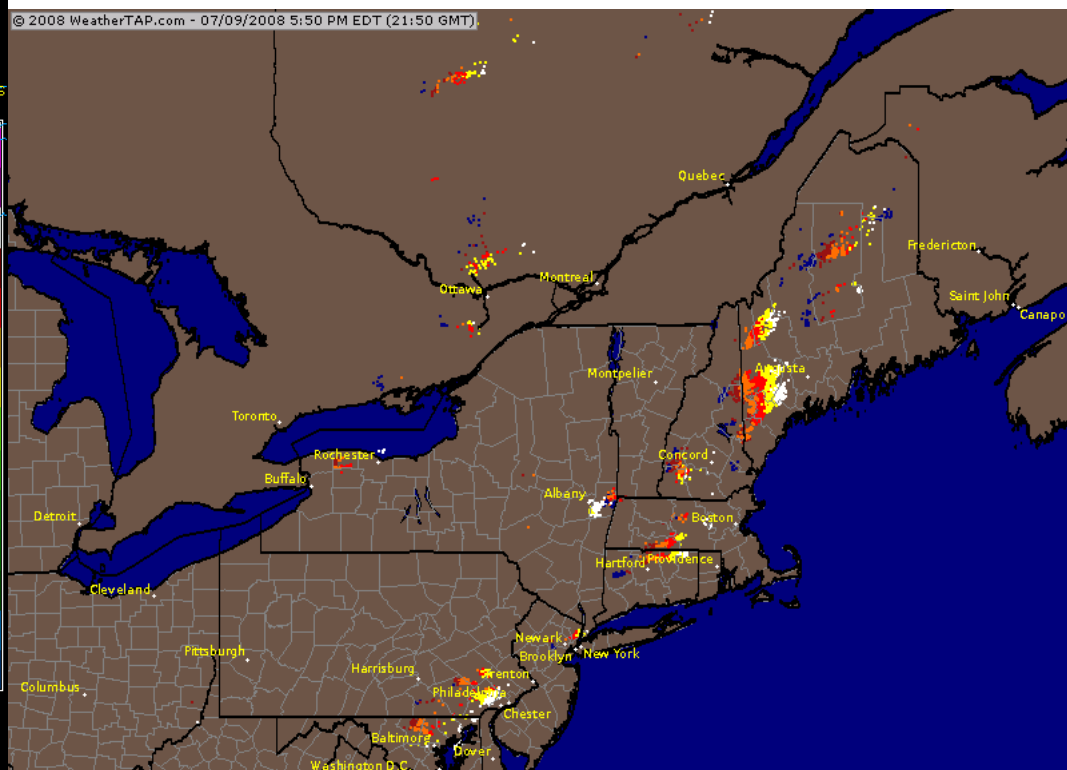
- Given its continuous space and time coverage, an average detection efficiency of ~95% and mean location errors of <500 m, we explore using the NLDN to verify thunderstorm occurrence





UALB THUNDERSTORM FORECASTING CONTEST CONSENSUS FOR: 7/9/08

FORECASTER	ALB	GSO	BNA	TPA	OKC	OMA	SPI	BIS	DEN	SLC
CONSENSUS	7	6	7	4	5	3	0	2	1	0
GAZA	7	3	8	3	6	4	0	3	1	0
CANNON	6	7	6	5	5	2	1	2	1	0
LAZEAR	5	7	6	3	5	3	1	2	1	0
T. WASULA	6	7	7	4	5	3	0	3	2	1
GALARNEAU	6	5	6	4	5	3	1	4	3	0
CORBOSIERO	8	7	6	5	5	3	0	3	2	0
SCALORA	6	6	8	5	5	3	0	3	2	0
WILSON	7	7	8	7	6	4	0	2	1	0
J. JONES	7	8	7	6	6	5	0	2	1	0
McGRADY	7	5	5	5	6	3	0	2	0	0
CASTELLANO	7	4	8	2	6	1	1	3	1	0
GRIFFIN	6	8	7	3	5	3	0	2	1	0
POLLAK	9	6	8	5	6	3	0	1	0	0
TRYPALUK	6	6	7	3	4	3	1	1	3	0
AVN MOS	6	5	6	4	3	2	1	3	3	0
ETA MOS	5	6	7	5	5	3	1	5	5	0
NGM MOS	9	7	9	6	6	3	2	4	6	0
OLD CLIMO	2	4	3	7	2	3	2	4	4	2
NEW CLIMO	2	4	3	6	2	3	2	3	4	2



KALB 091700Z VRB04KT 1 1/4SM R01/3000VP6000FT +RA SCT003 BKN024 BKN040 26/23 A2971 RMK AO2 TWR VIS 2 VIS 3/4V3 P0008

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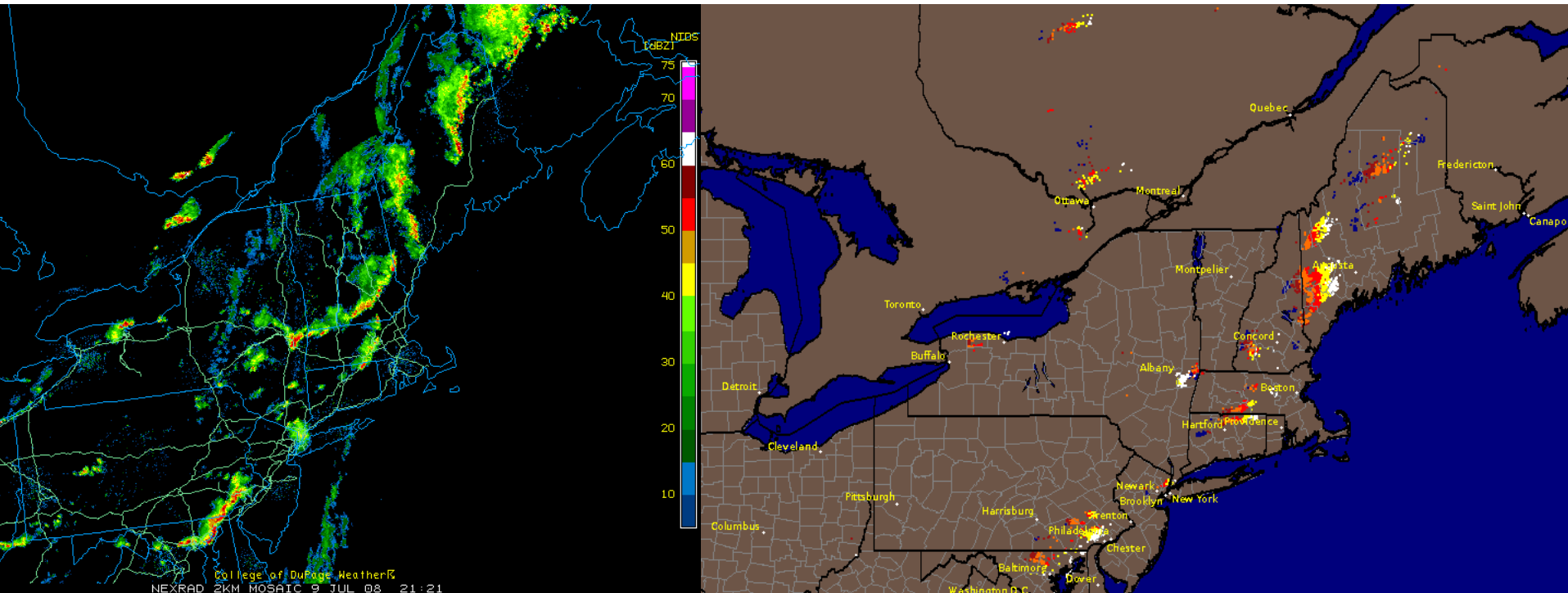
KALB 091732Z 23008G18KT 1 3/4SM R01/3500VP6000FT HZ BKN024 BKN029 26/23 A2971 RMK AO2 TWR VIS 3 RAE31 P0018

KALB 091751Z 28007KT 6SM HZ FEW024 28/23 A2971 RMK AO2 RAE31 SLP056 P0018 60025 T02830228 10289 20250 56012

KALB 092151Z 26010KT 9SM CLR 26/21 A2969 RMK AO2 PK WND 26027/2109 RAB10E28 SLP051 P0001 T02610211

KALB 092251Z 28006KT 9SM FEW060 26/22 A2971 RMK AO2 SLP058 T02610217



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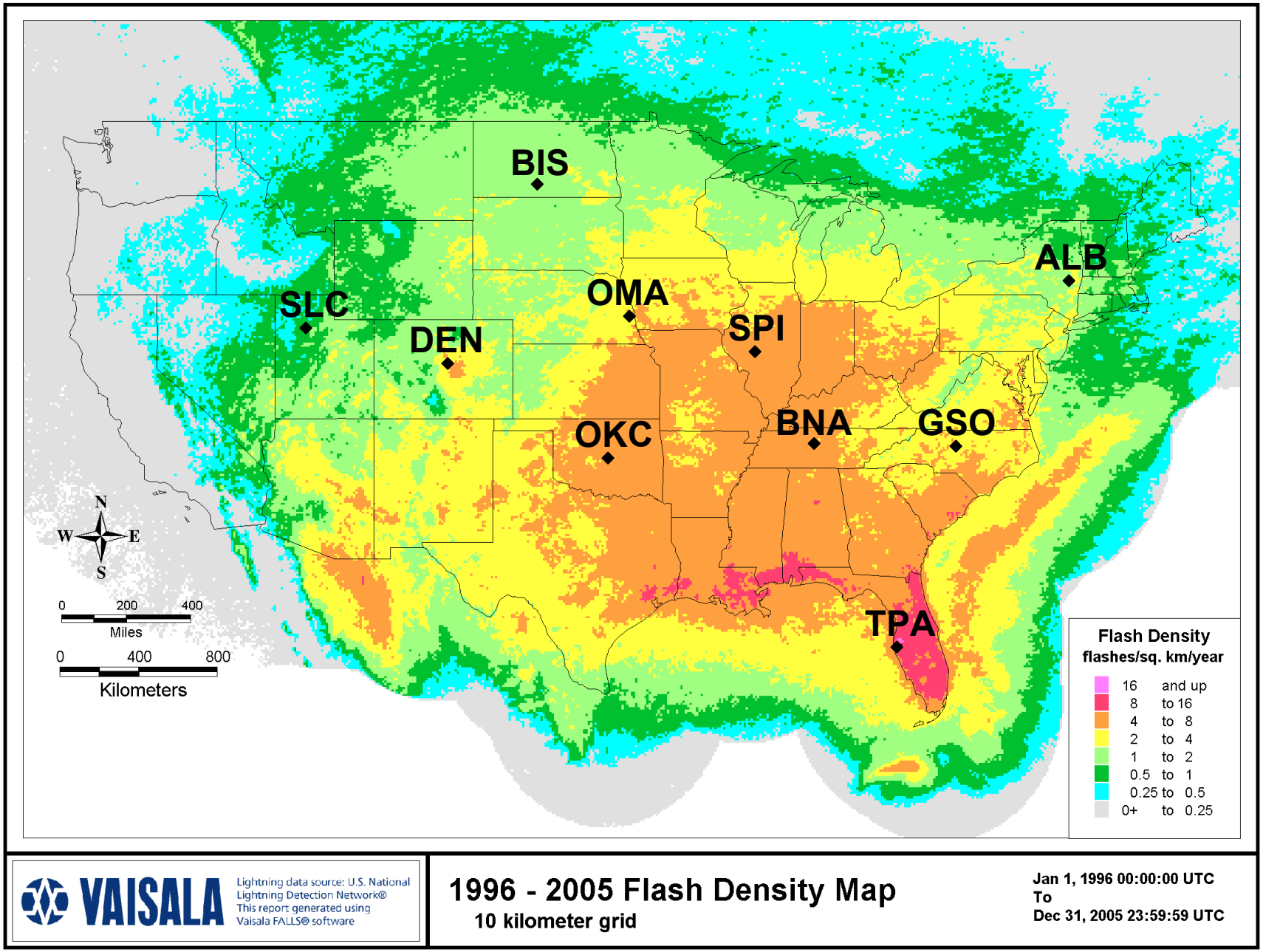


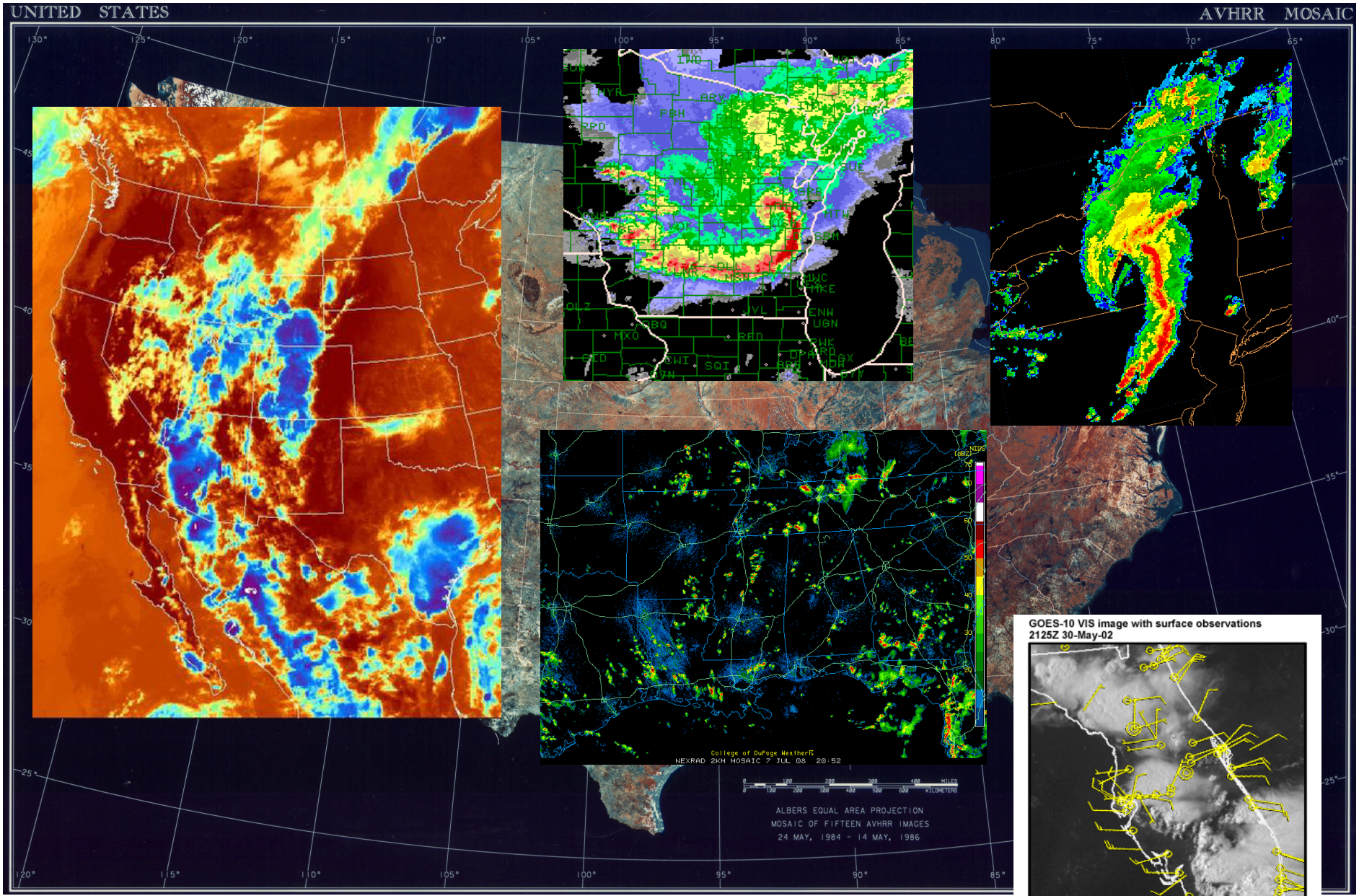
VAISALA

Lightning data source: U.S. National Lightning Detection Network®
This report generated using Vaisala FALLS® software

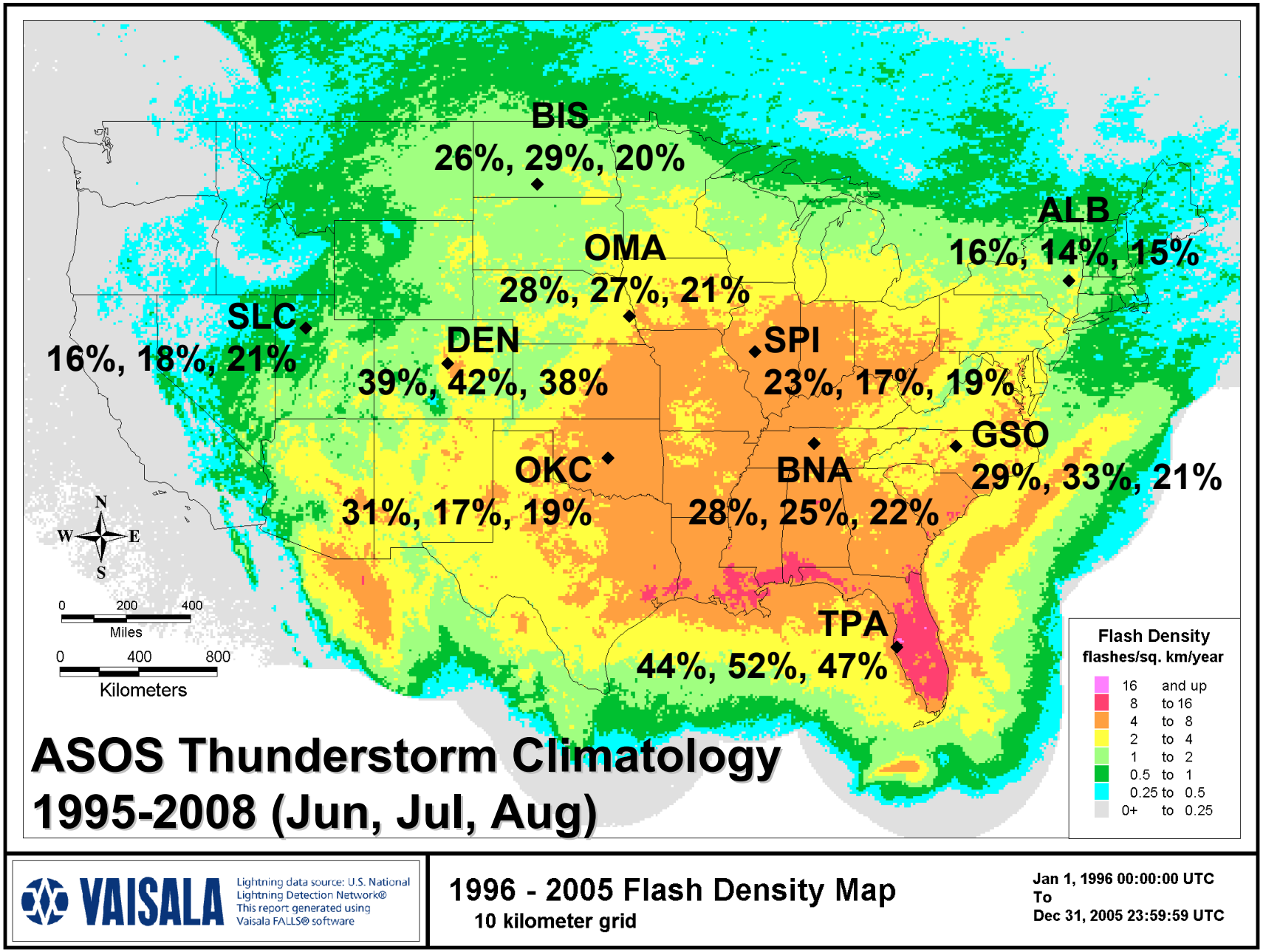
1996 - 2005 Flash Density Map

10 kilometer grid

Jan 1, 1996 00:00:00 UTC
To
Dec 31, 2005 23:59:59 UTC



GOES-10 VIS image with surface observations
2125Z 30-May-02



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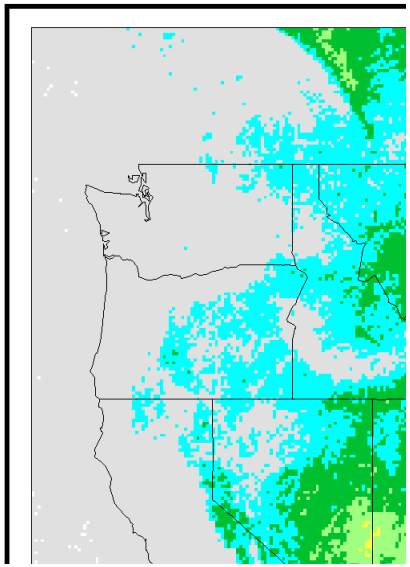

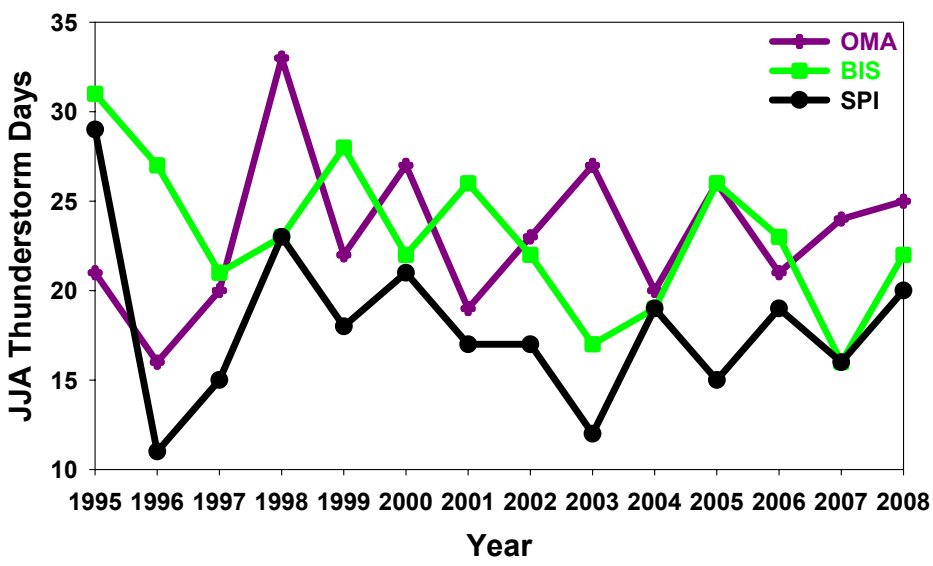

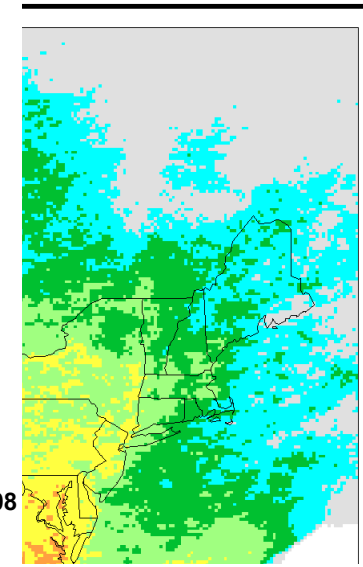

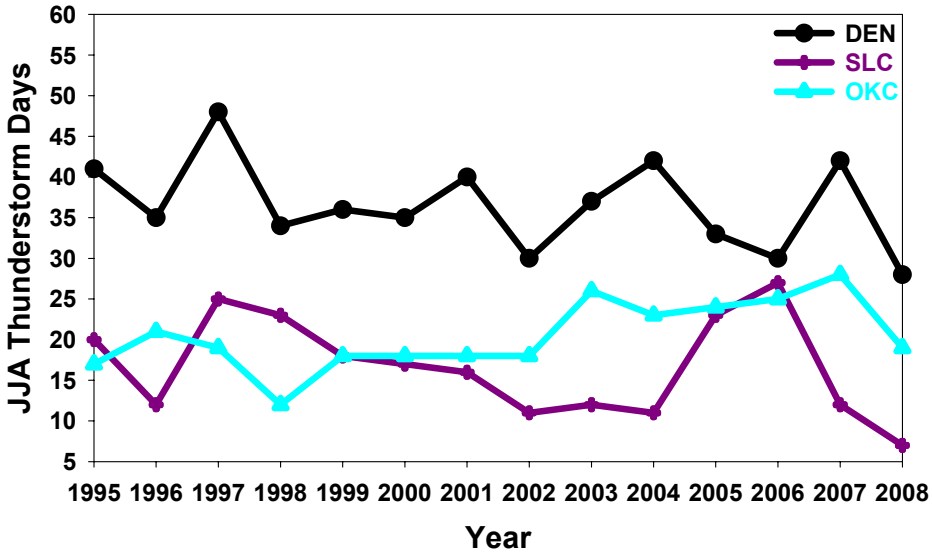

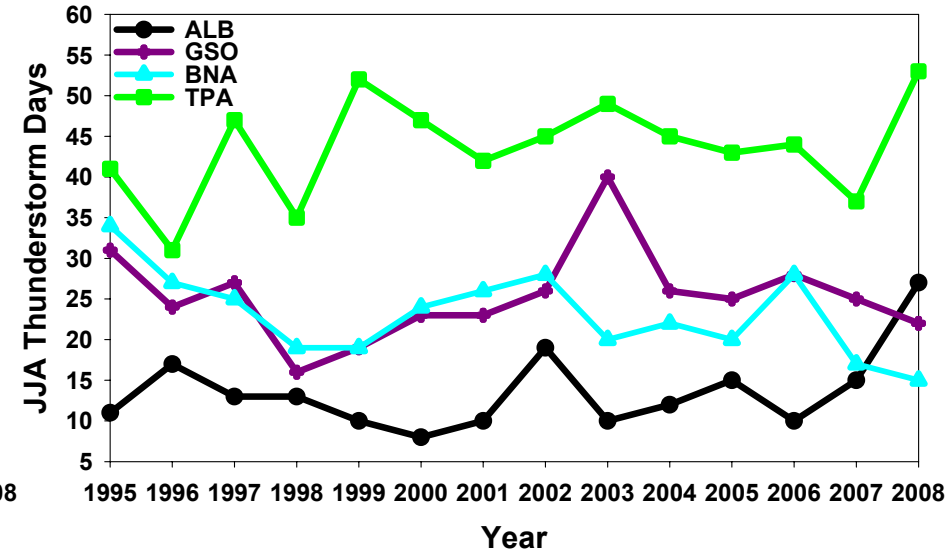

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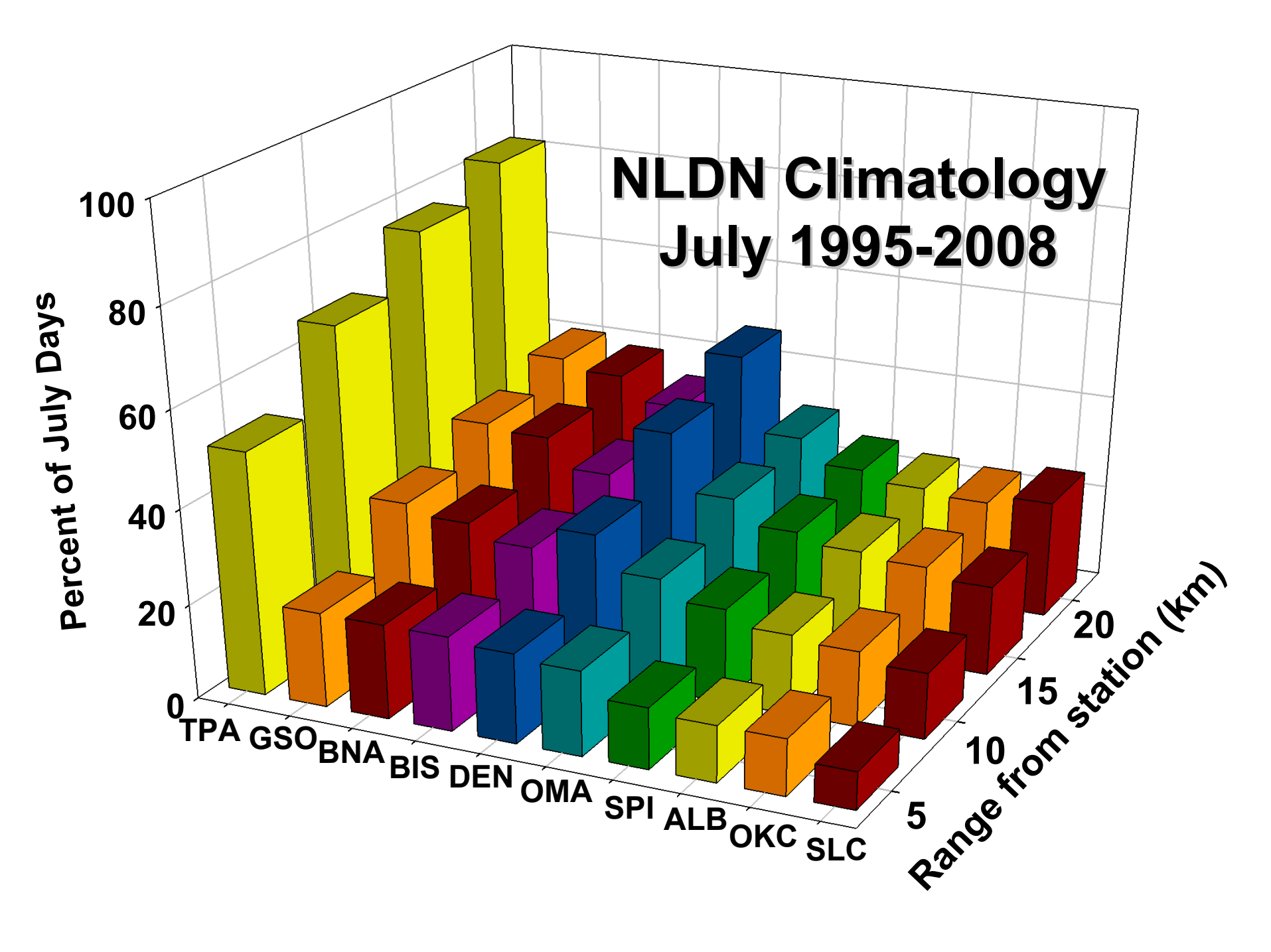
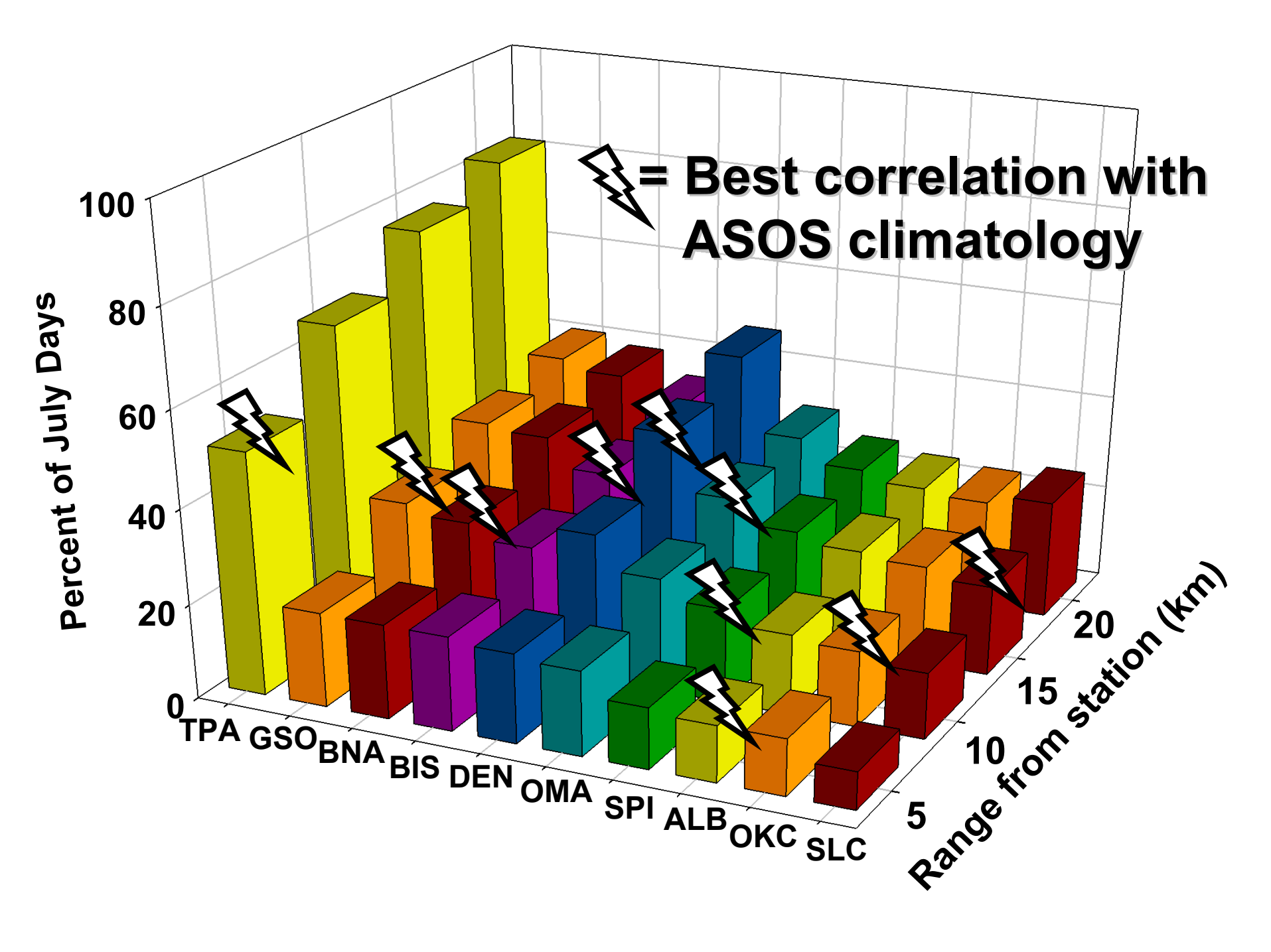
10 kilometer grid

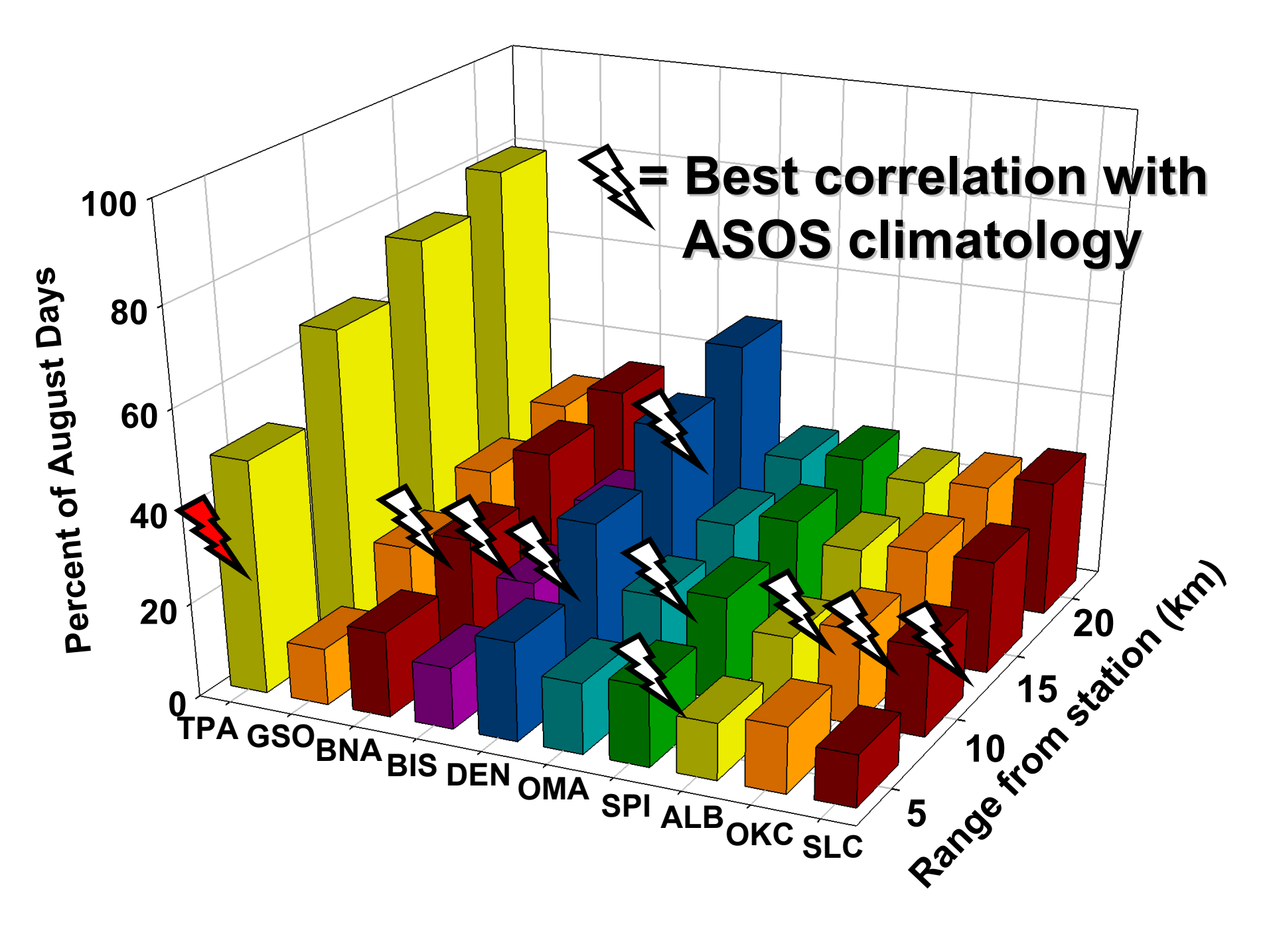
Jan 1, 1996 00:00:00 UTC
To
Dec 31, 2005 23:59:59 UTC

NLDN Lightning Climatology Methodology

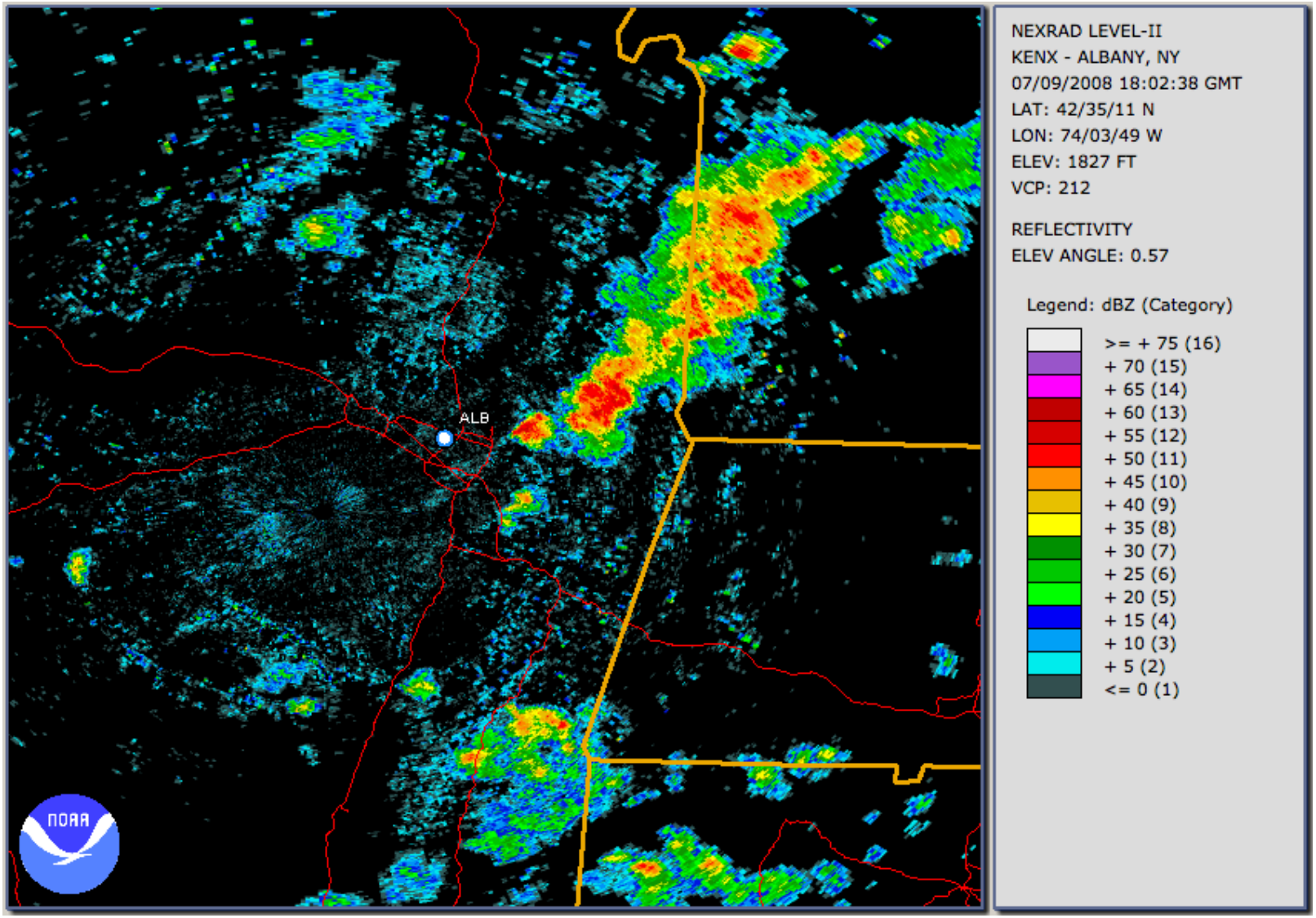
- To compare the ASOS TS reports with NLDN cloud-to-ground lightning, flash counts were totaled within 20 km of each ASOS location (in 5 km rings) based upon Bosart and Landin (1994) and Holle (personal communication, 2009)


NLDN Climatology
July 1995-2008
Percent of July Days
100
80
60
40
20
0
TPA
GSO
BNA
BIS
DEN
OMA
SPI
ALB
OKC
SLC
5
10
15
20
Range from station (km)

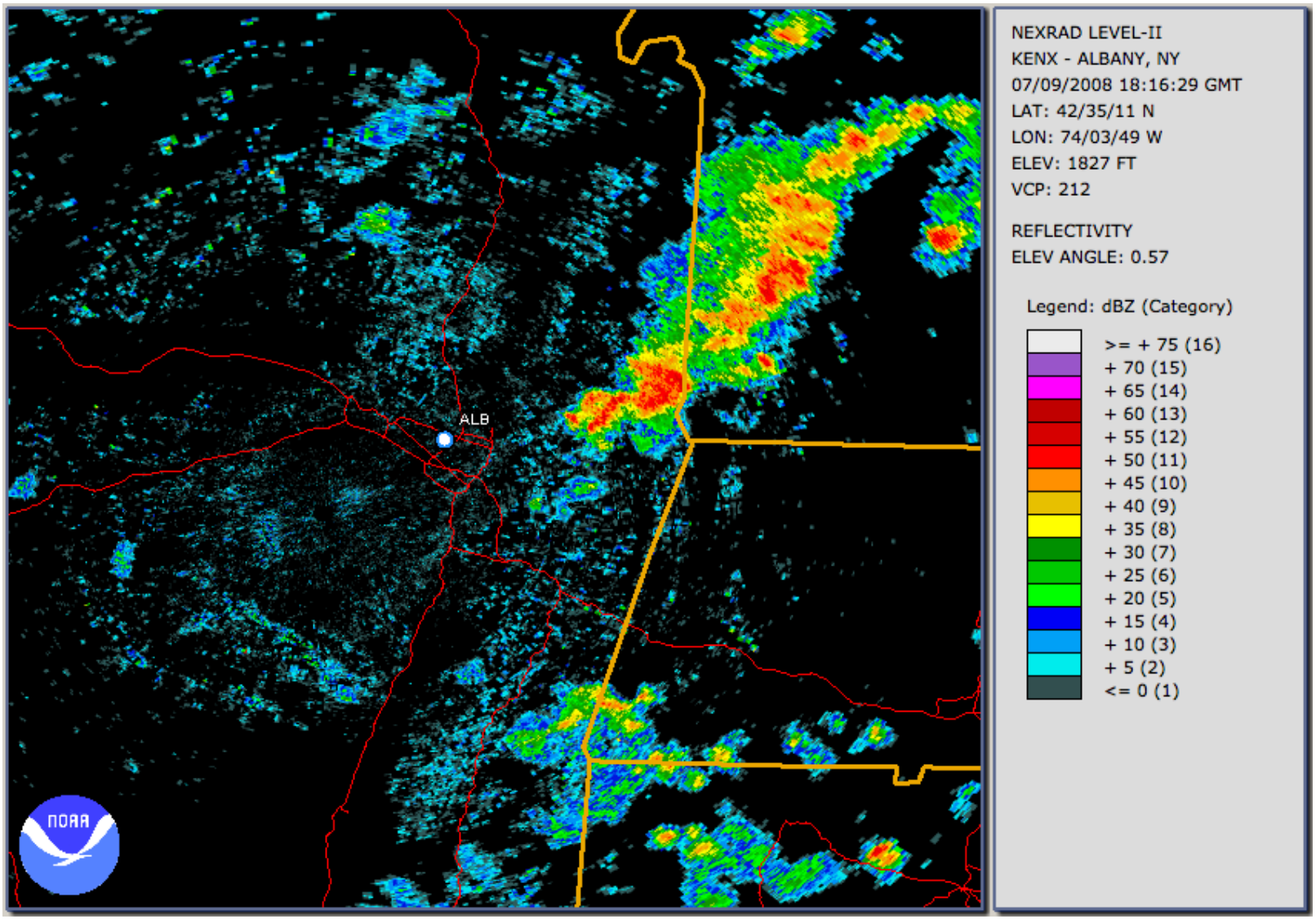

= Best correlation with ASOS climatology
Percent of July Days
100
80
60
40
20
0
TPA
GSO
BNA
BIS
DEN
OMA
SPI
ALB
OKC
SLC
5
10
15
20
Range from station (km)


= Best correlation with ASOS climatology
Percent of August Days
100
80
60
40
20
0
TPA
GSO
BNA
BIS
DEN
OMA
SPI
ALB
OKC
SLC
5
10
15
20
Range from station (km)

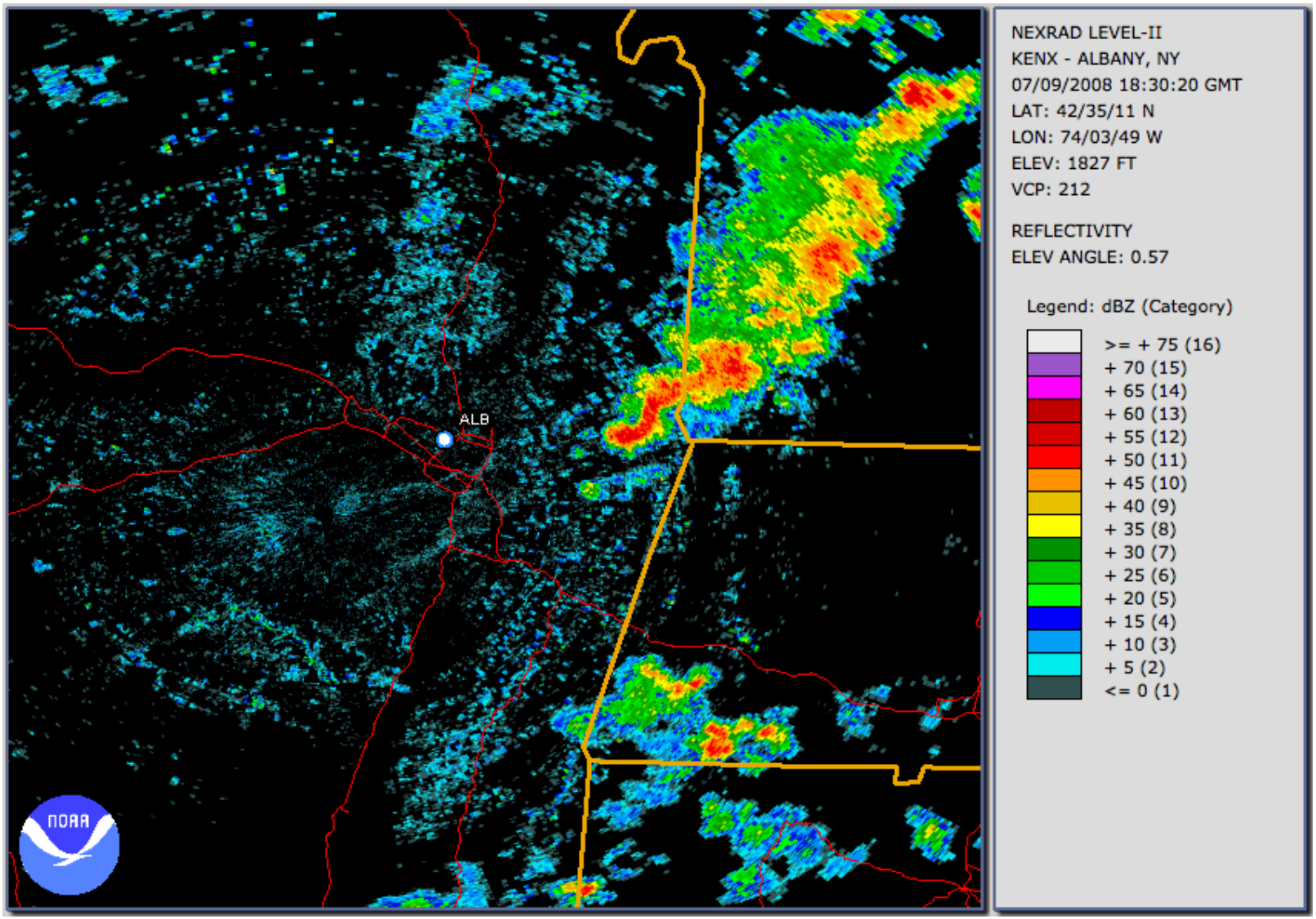
KENX Radar ALB ASOS downtime case
1803 UTC 09 July 2008



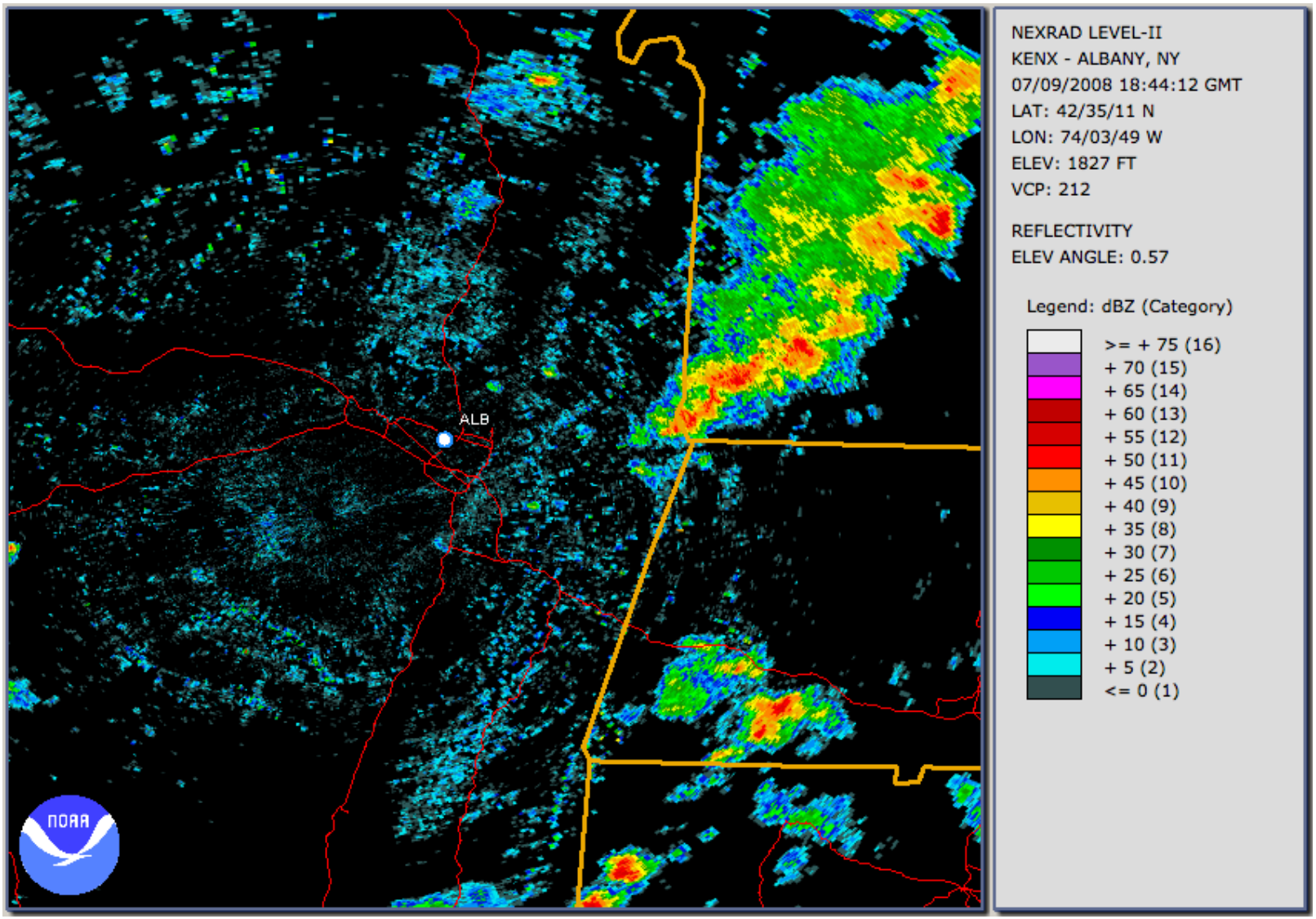
KENX Radar ALB ASOS downtime case
1816 UTC 09 July 2008



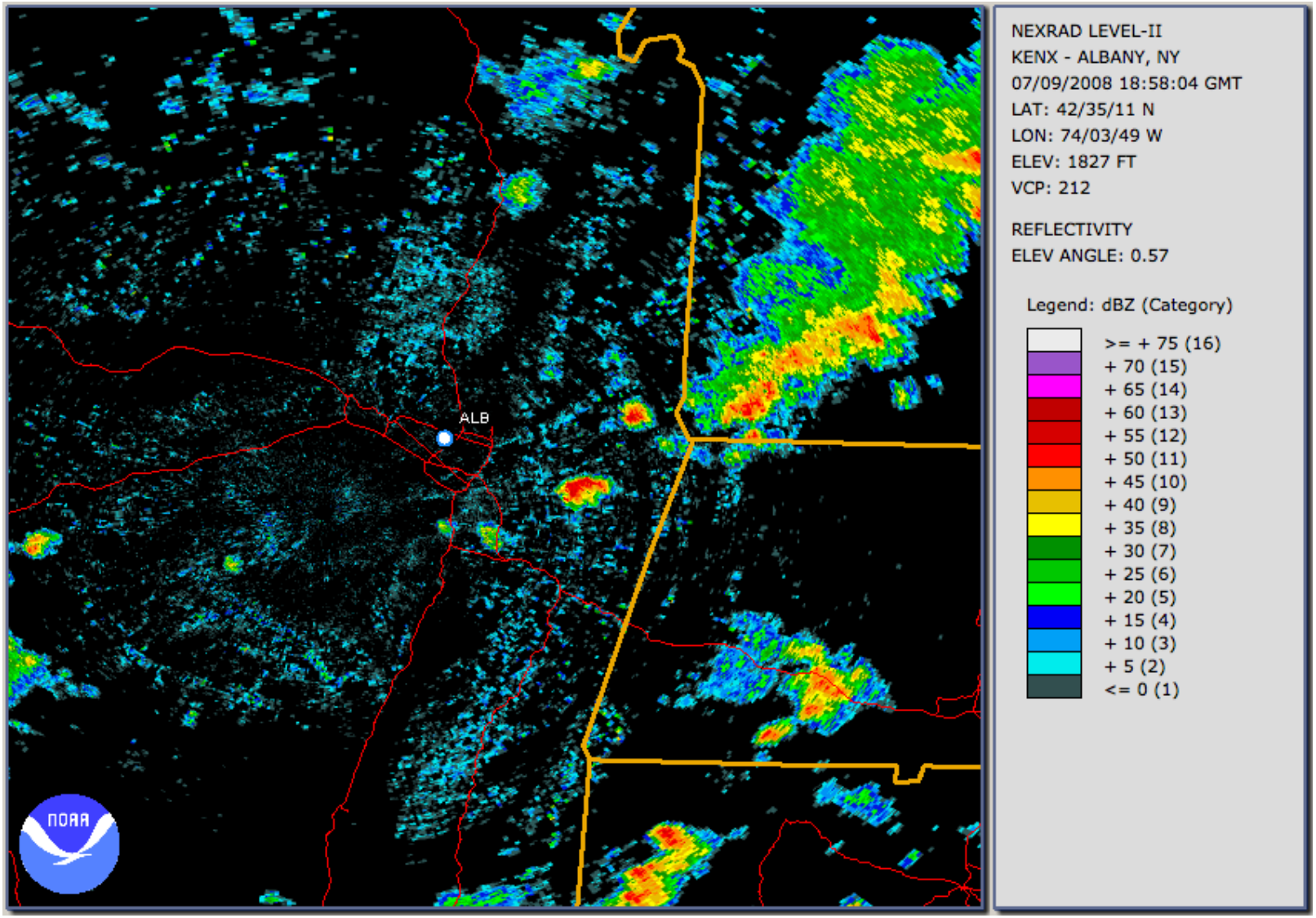
KENX Radar ALB ASOS downtime case
1830 UTC 09 July 2008



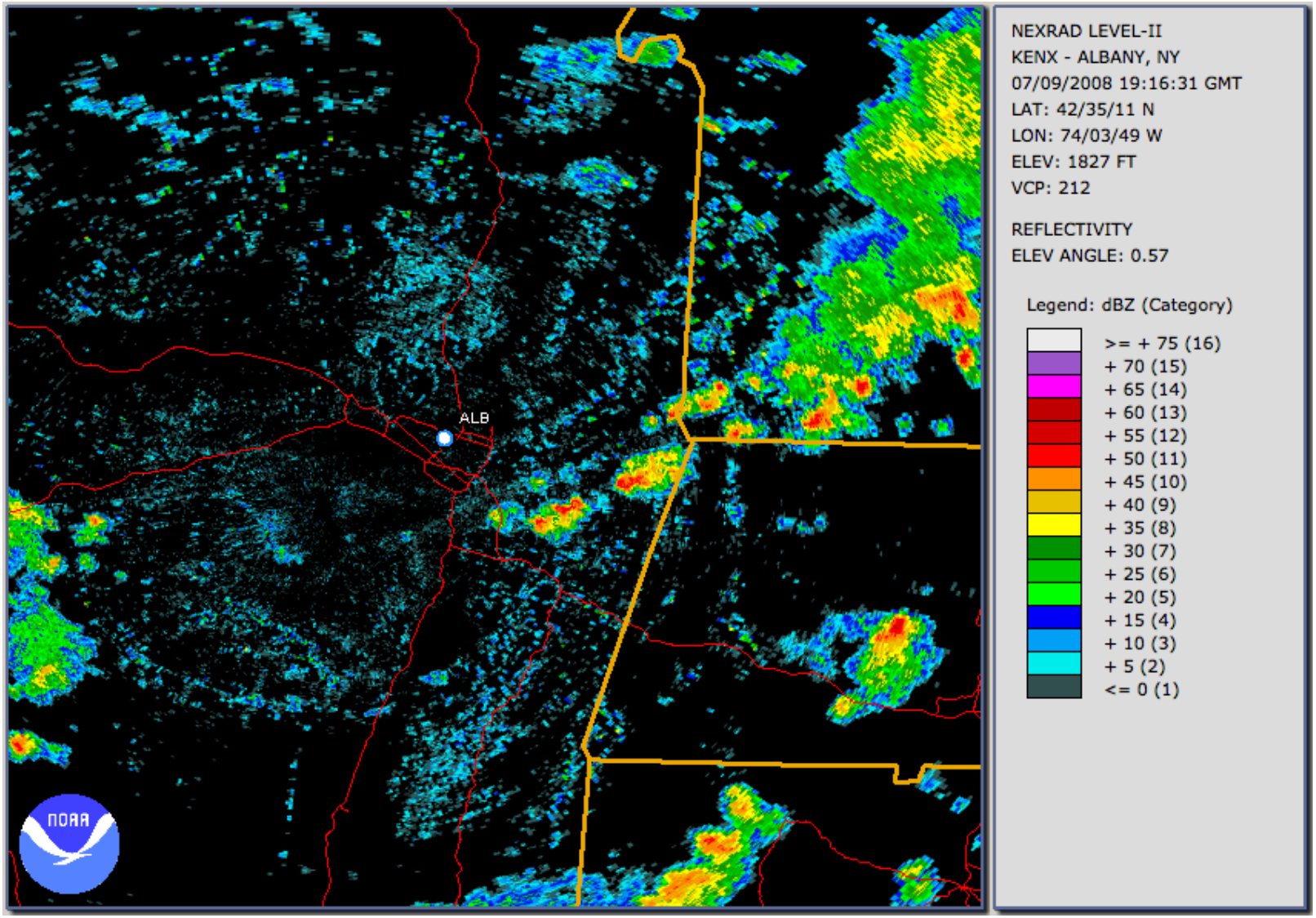
KENX Radar ALB ASOS downtime case
1844 UTC 09 July 2008



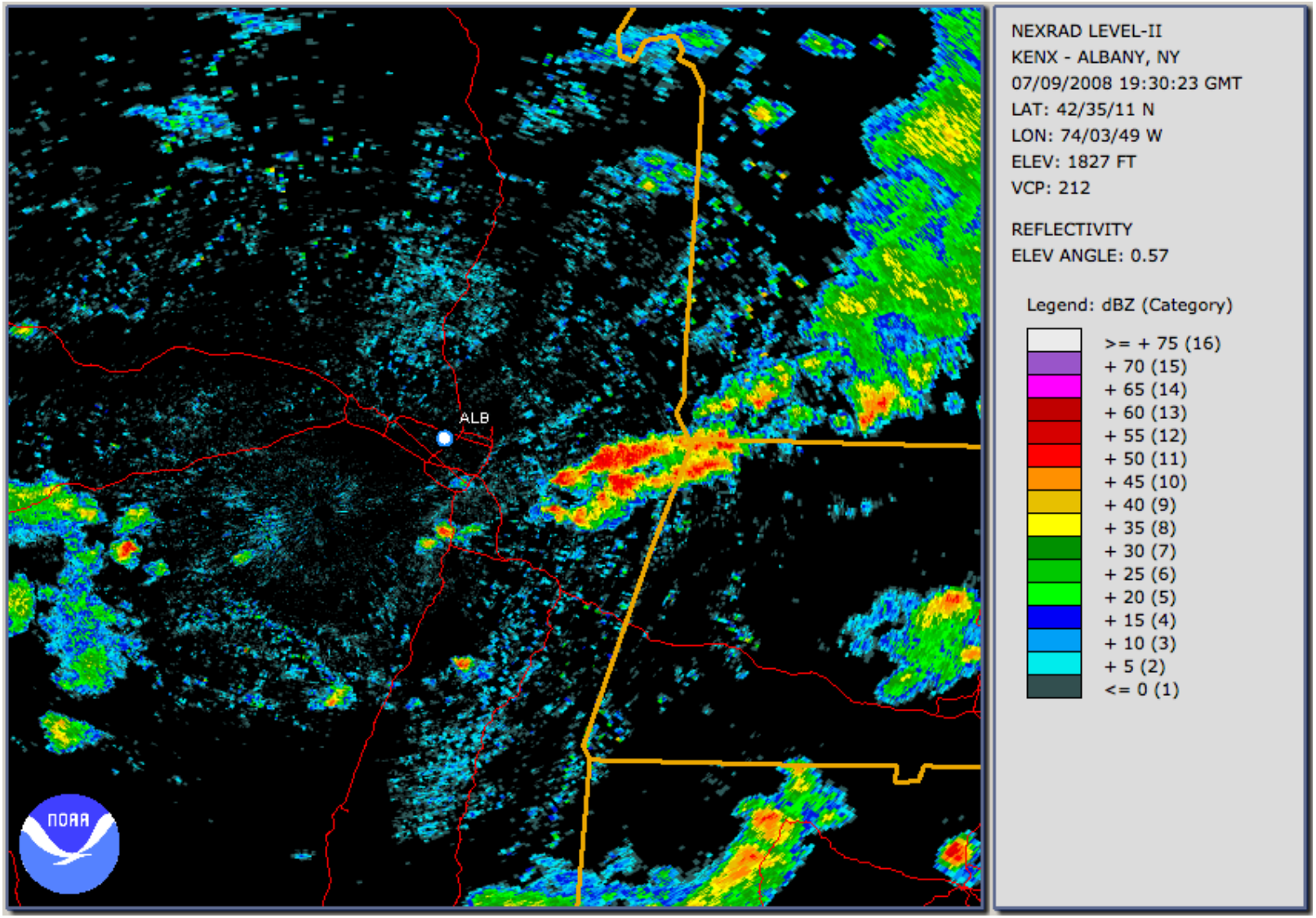
KENX Radar ALB ASOS downtime case
1858 UTC 09 July 2008



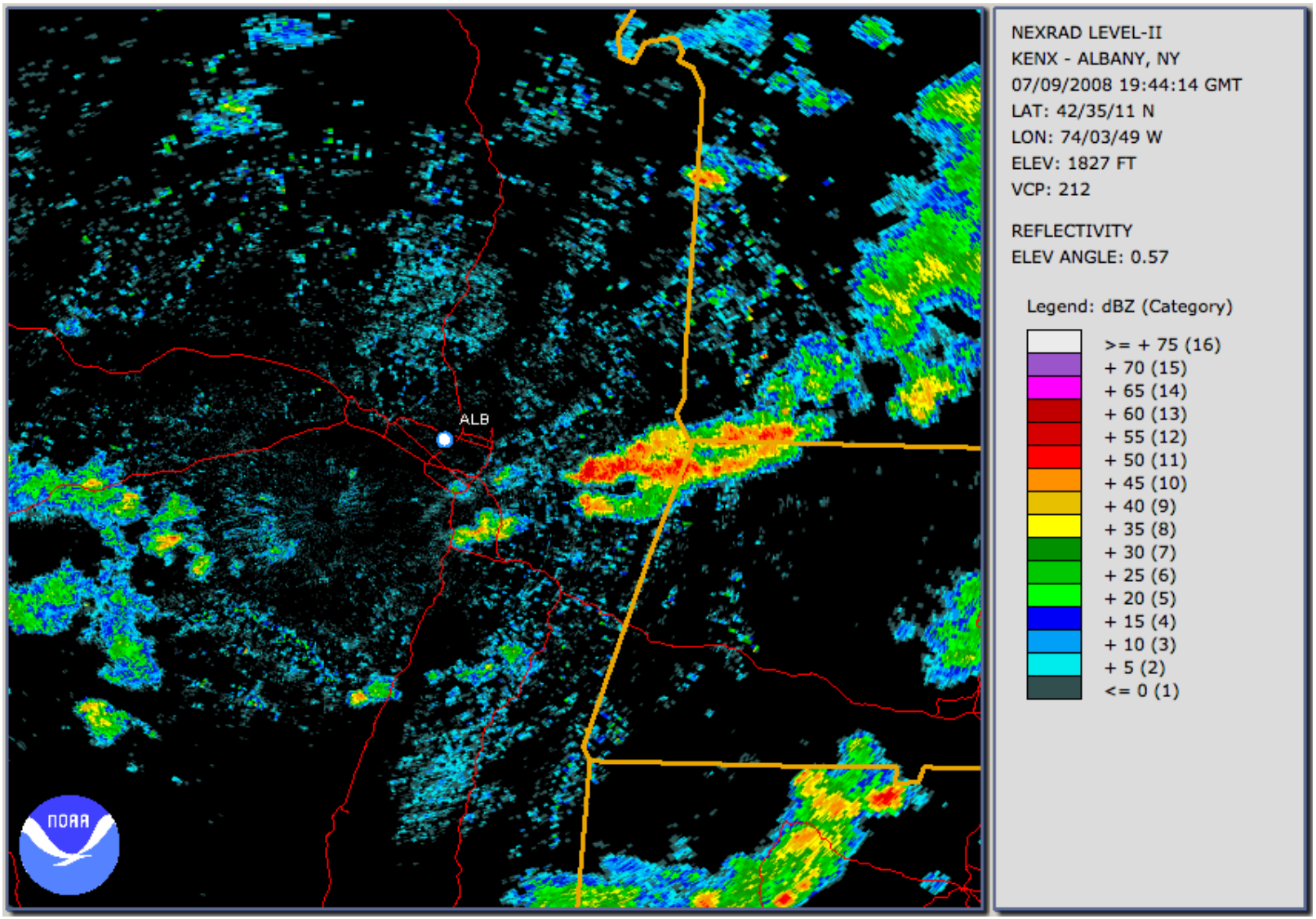
KENX Radar ALB ASOS downtime case
1917 UTC 09 July 2008



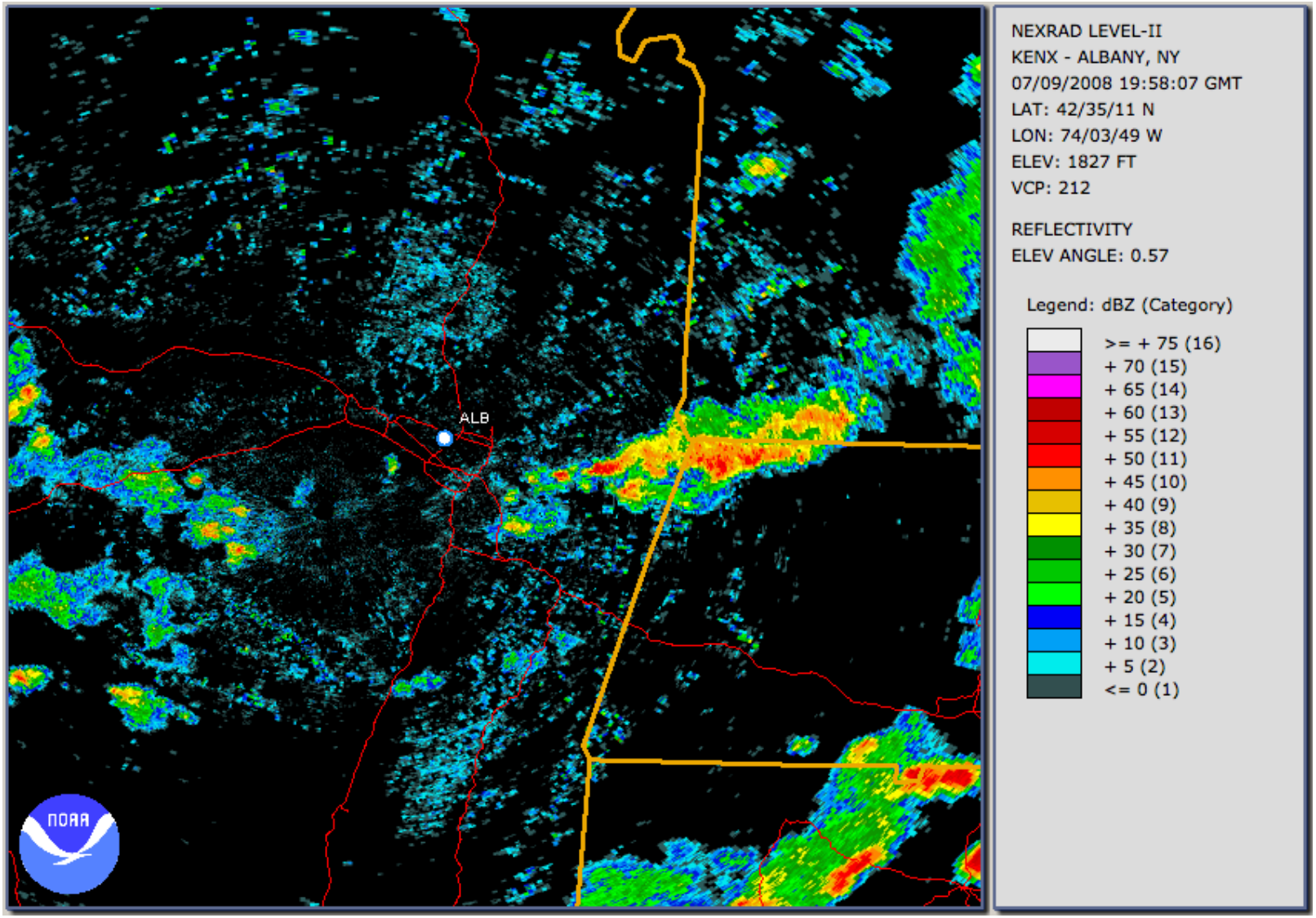
KENX Radar ALB ASOS downtime case
1930 UTC 09 July 2008



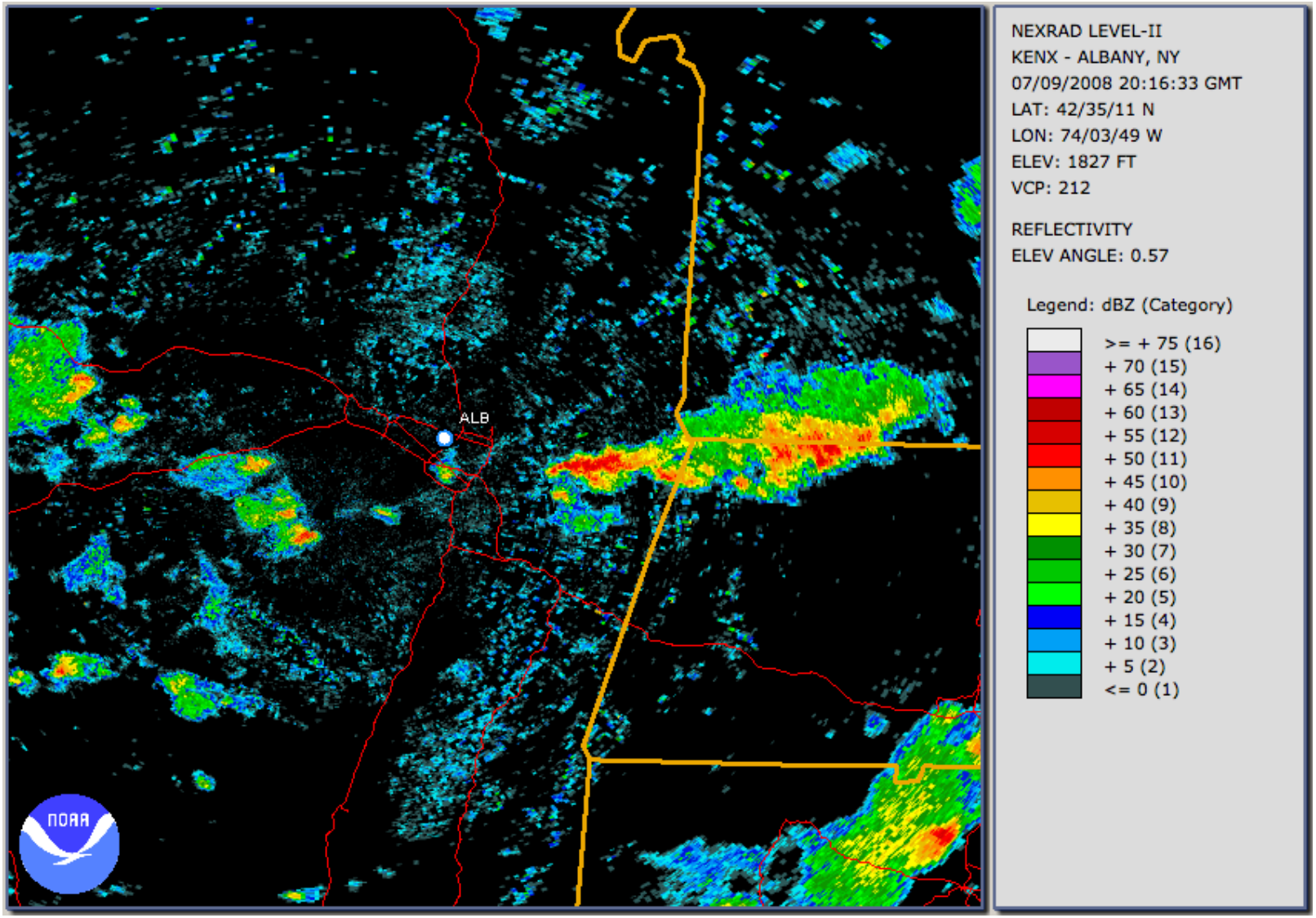
KENX Radar ALB ASOS downtime case
1944 UTC 09 July 2008



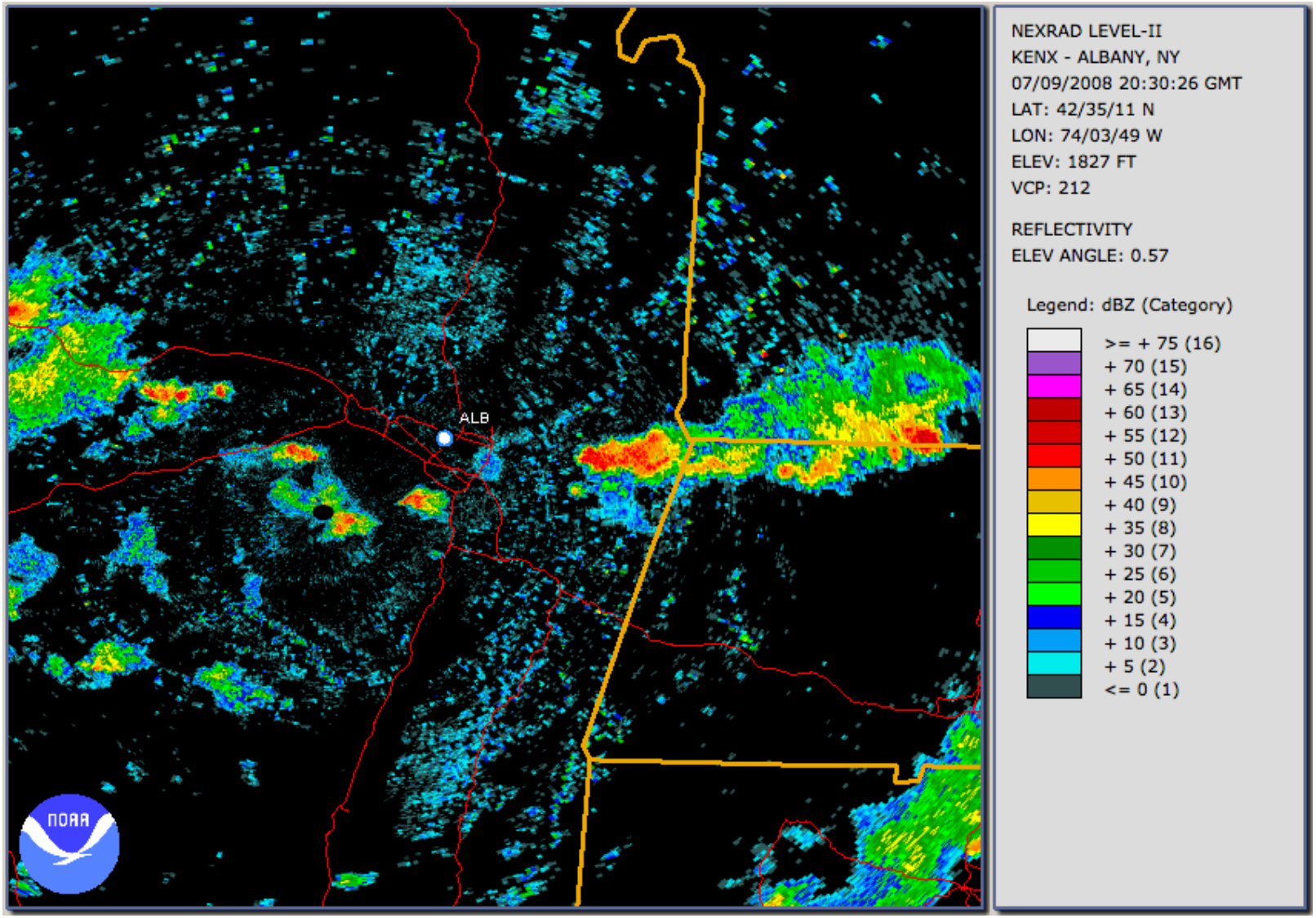
KENX Radar ALB ASOS downtime case
1958 UTC 09 July 2008



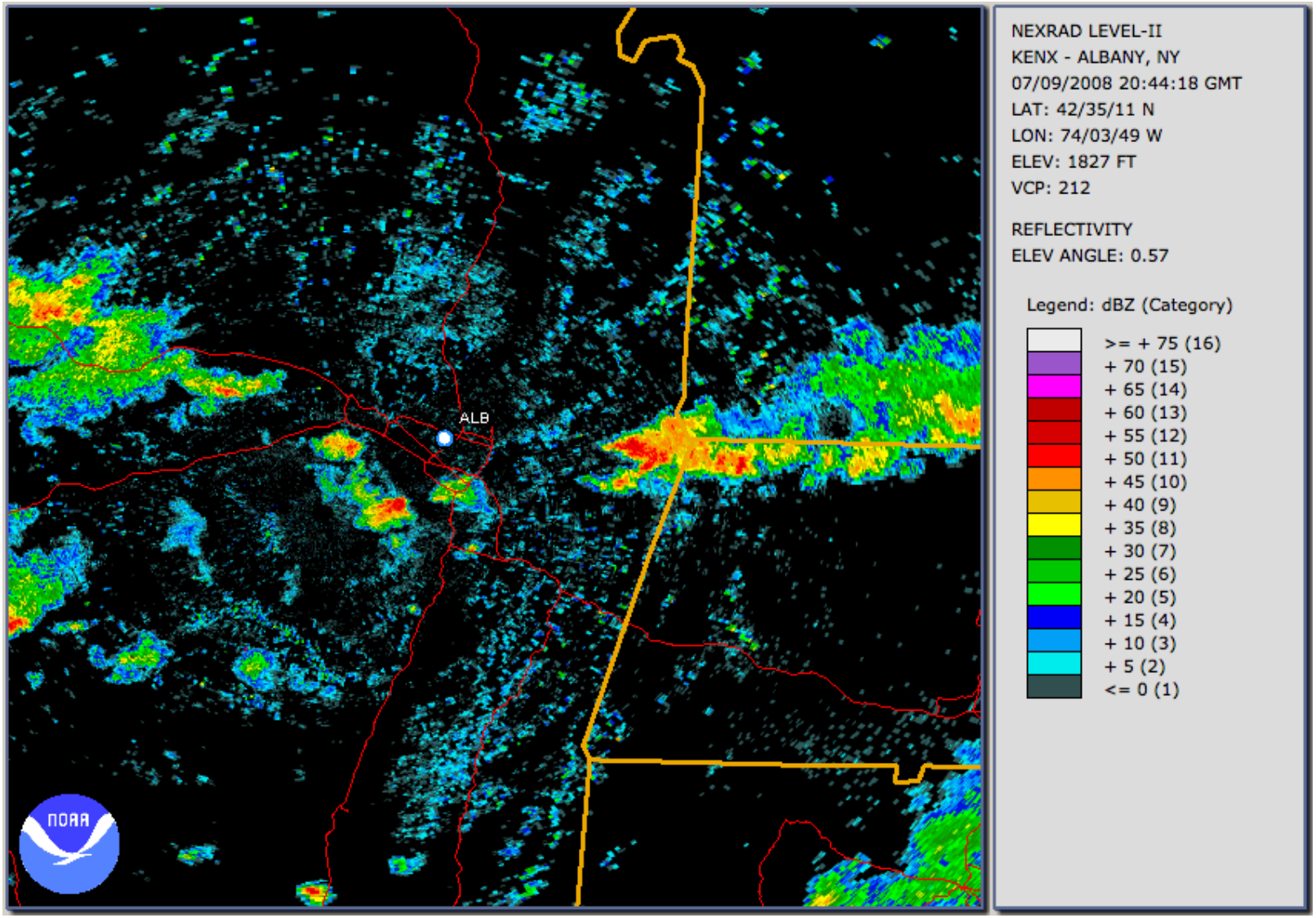
KENX Radar ALB ASOS downtime case
2017 UTC 09 July 2008



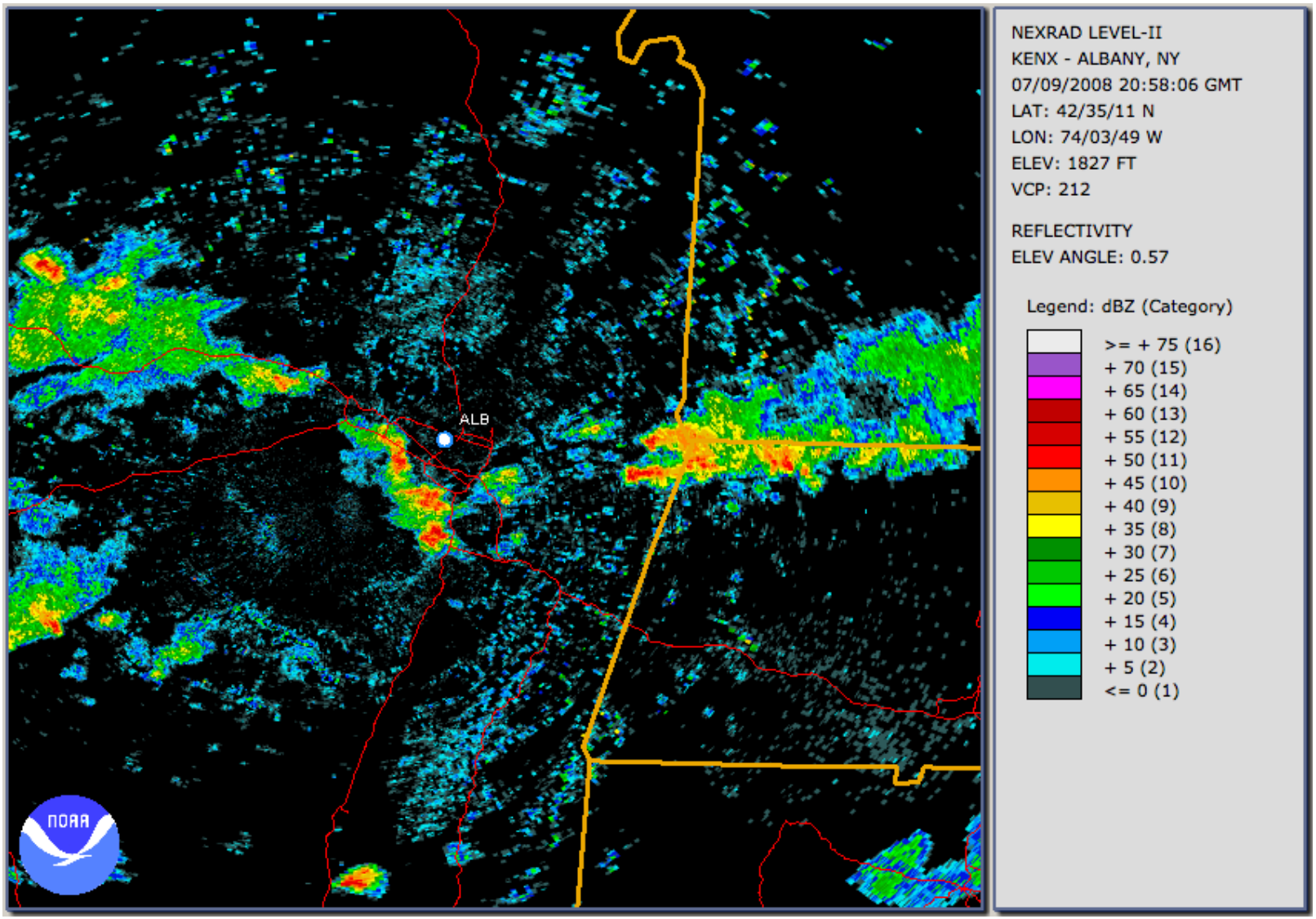
KENX Radar ALB ASOS downtime case
2030 UTC 09 July 2008



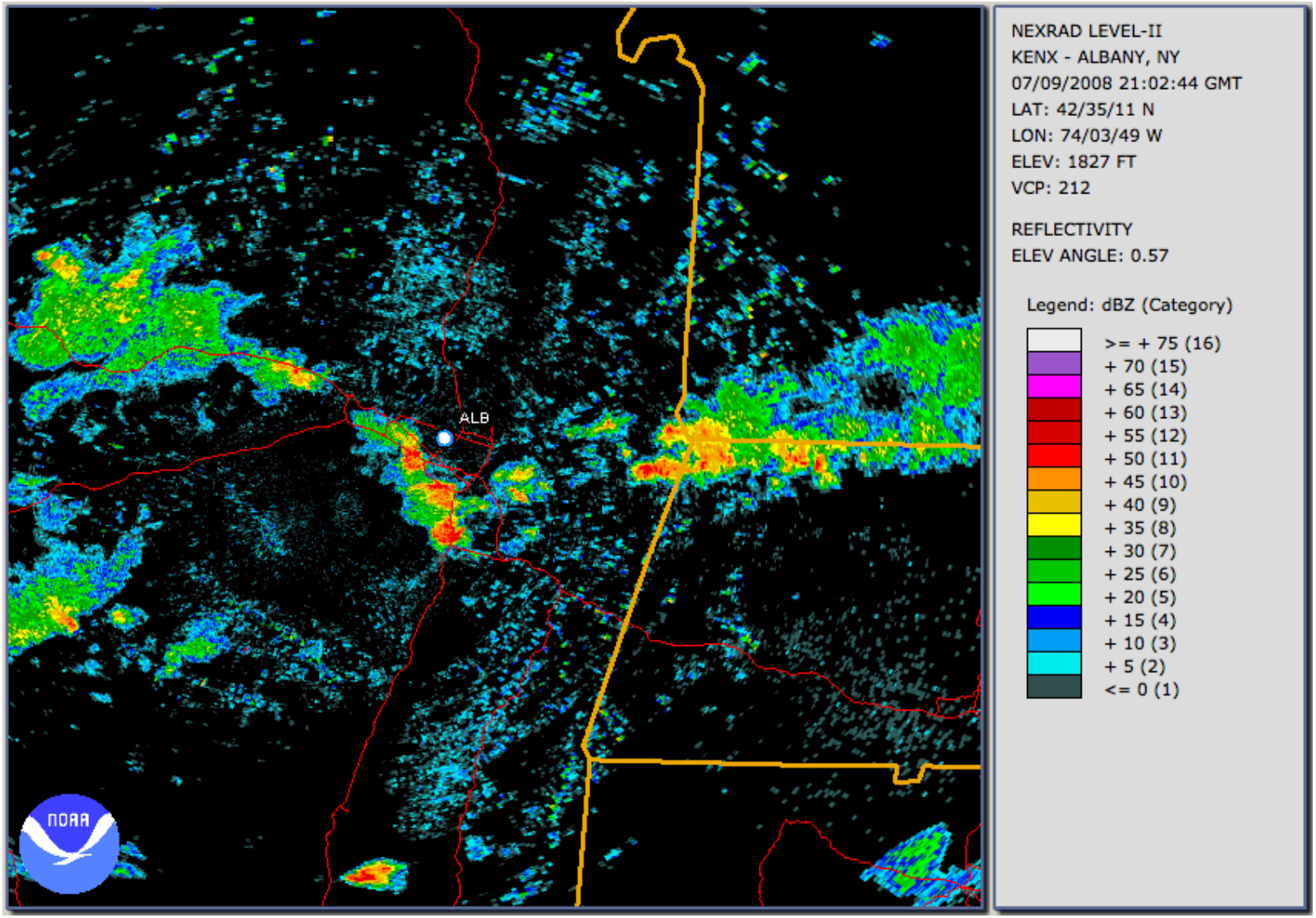
KENX Radar ALB ASOS downtime case
2044 UTC 09 July 2008



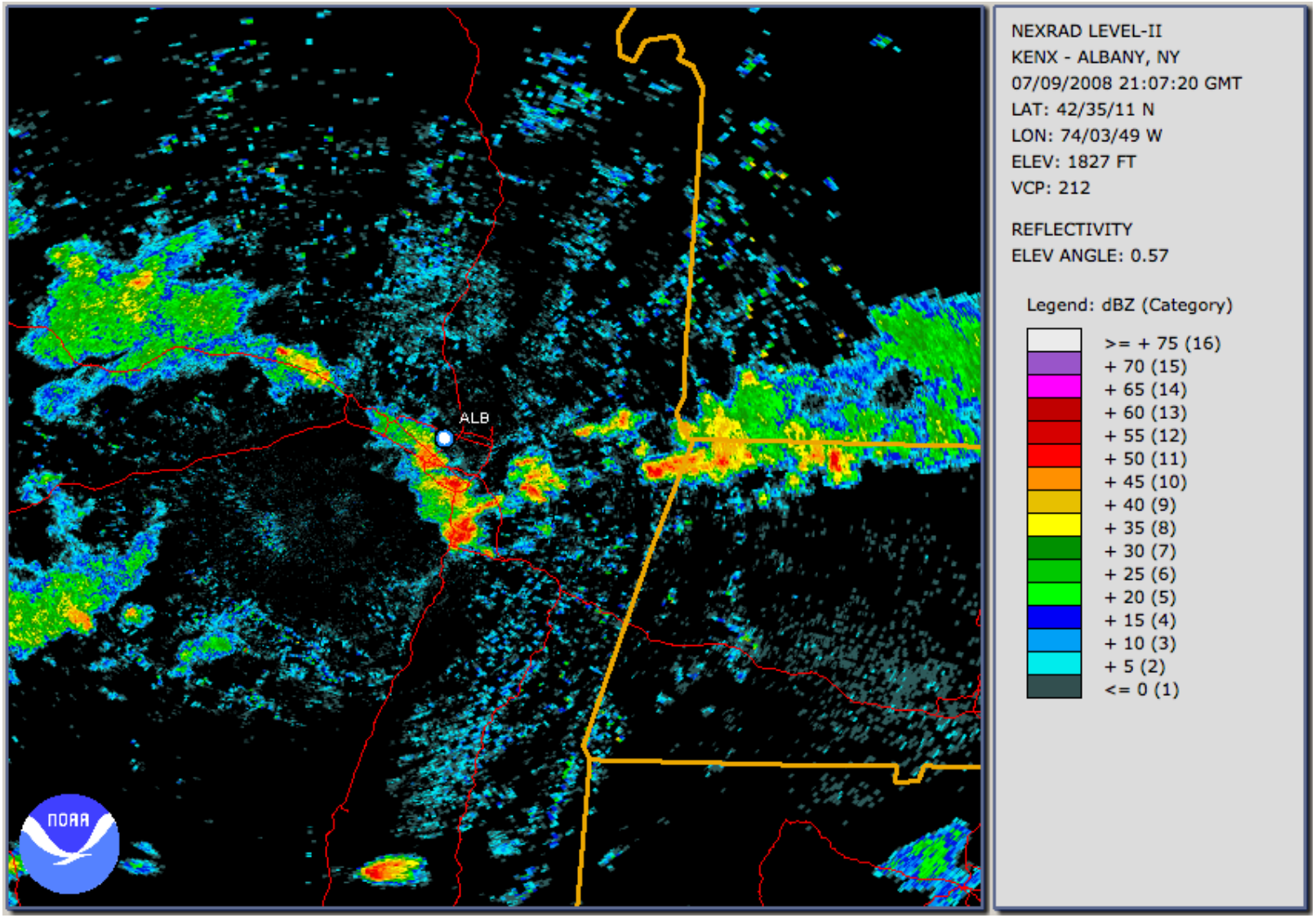
KENX Radar ALB ASOS downtime case
2058 UTC 09 July 2008



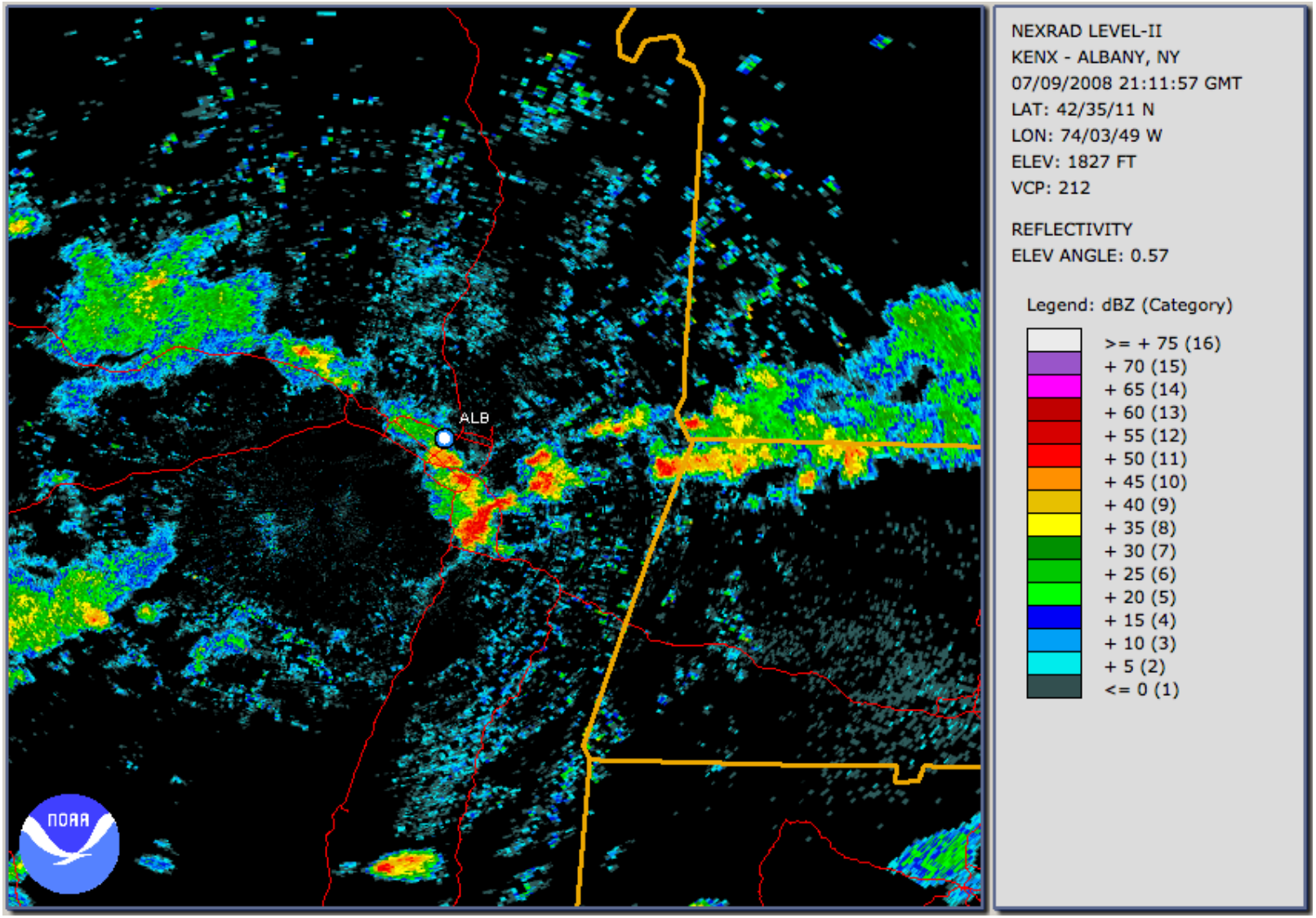
KENX Radar ALB ASOS downtime case
2103 UTC 09 July 2008



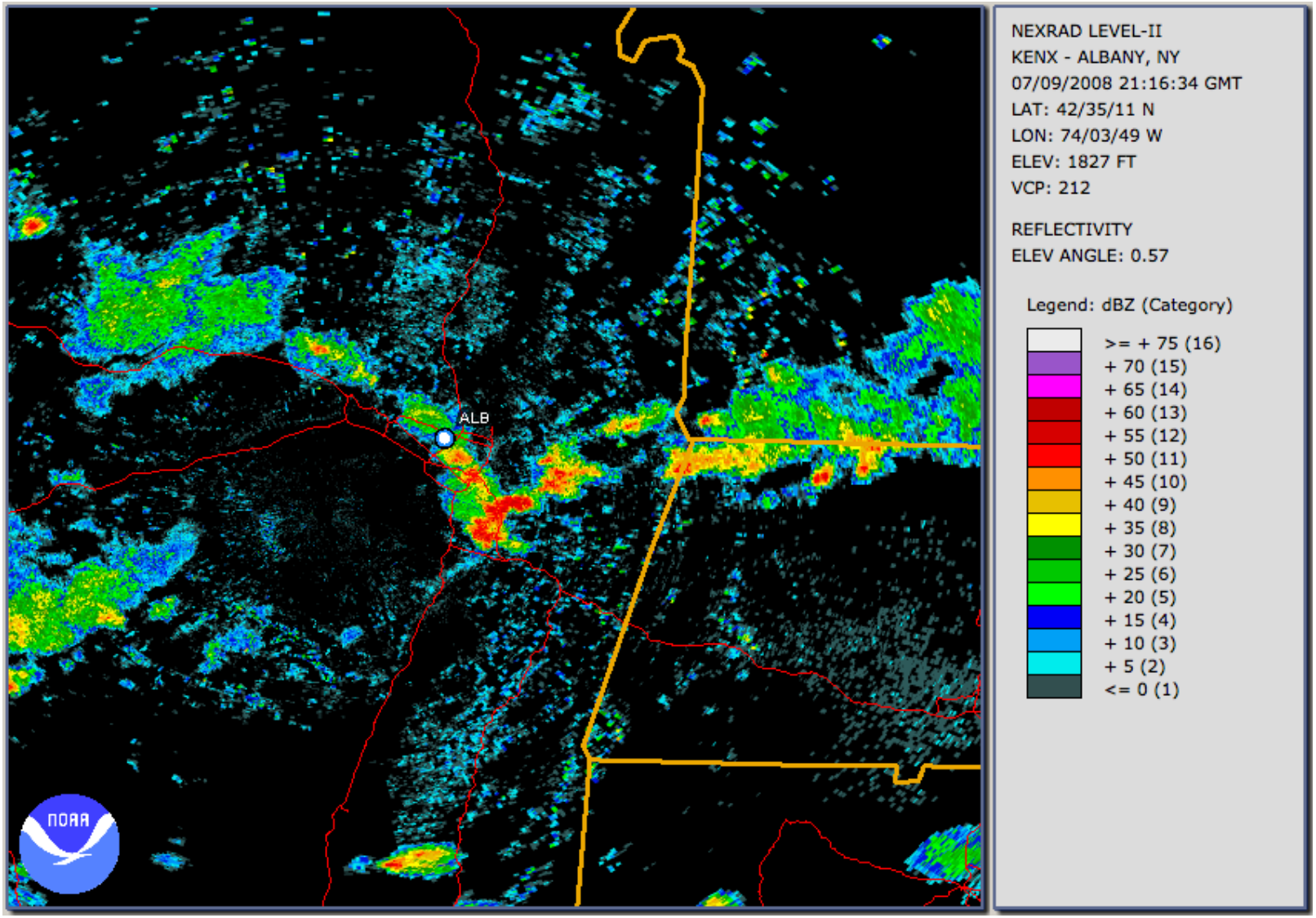
KENX Radar ALB ASOS downtime case
2107 UTC 09 July 2008



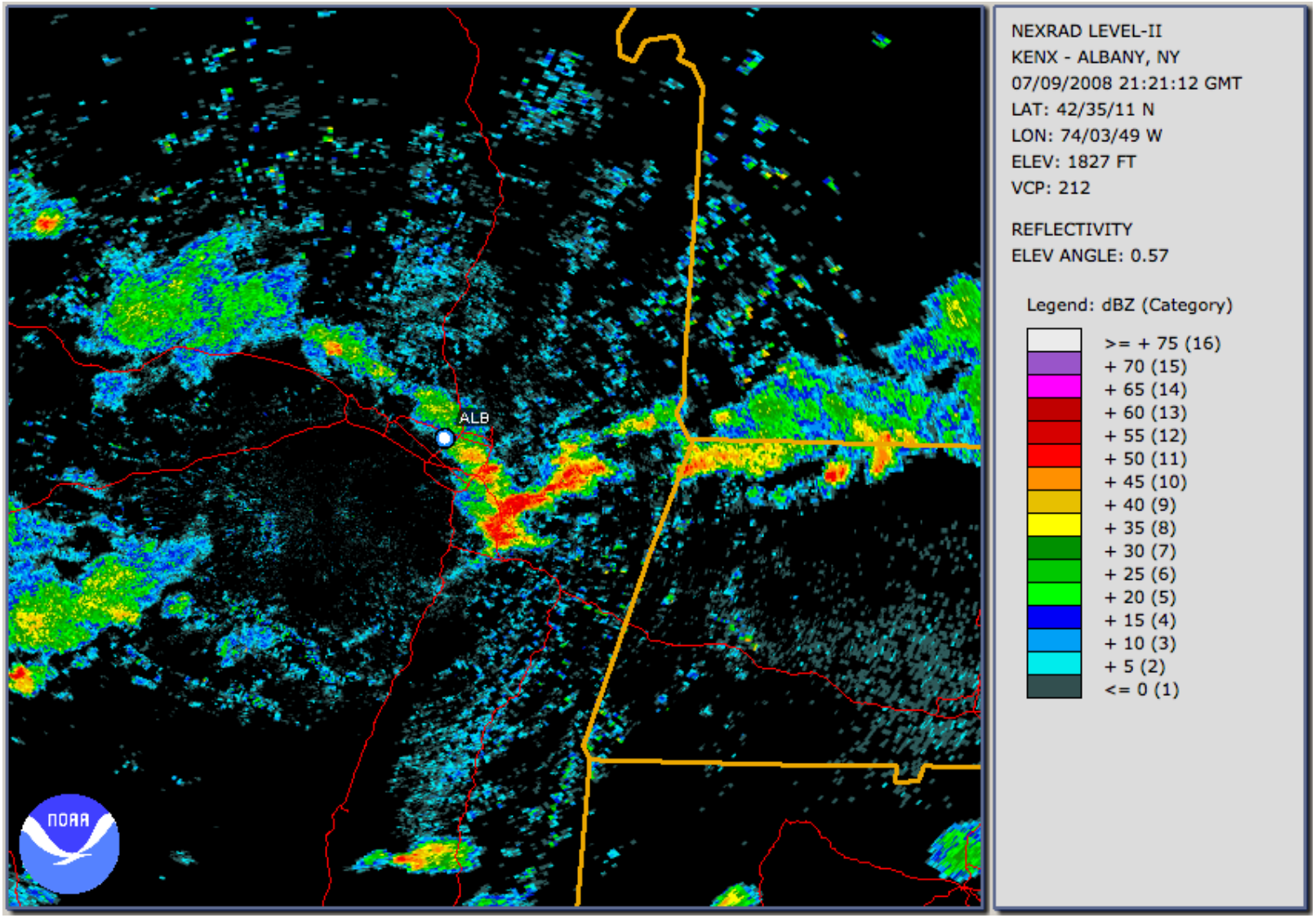
KENX Radar ALB ASOS downtime case
2112 UTC 09 July 2008



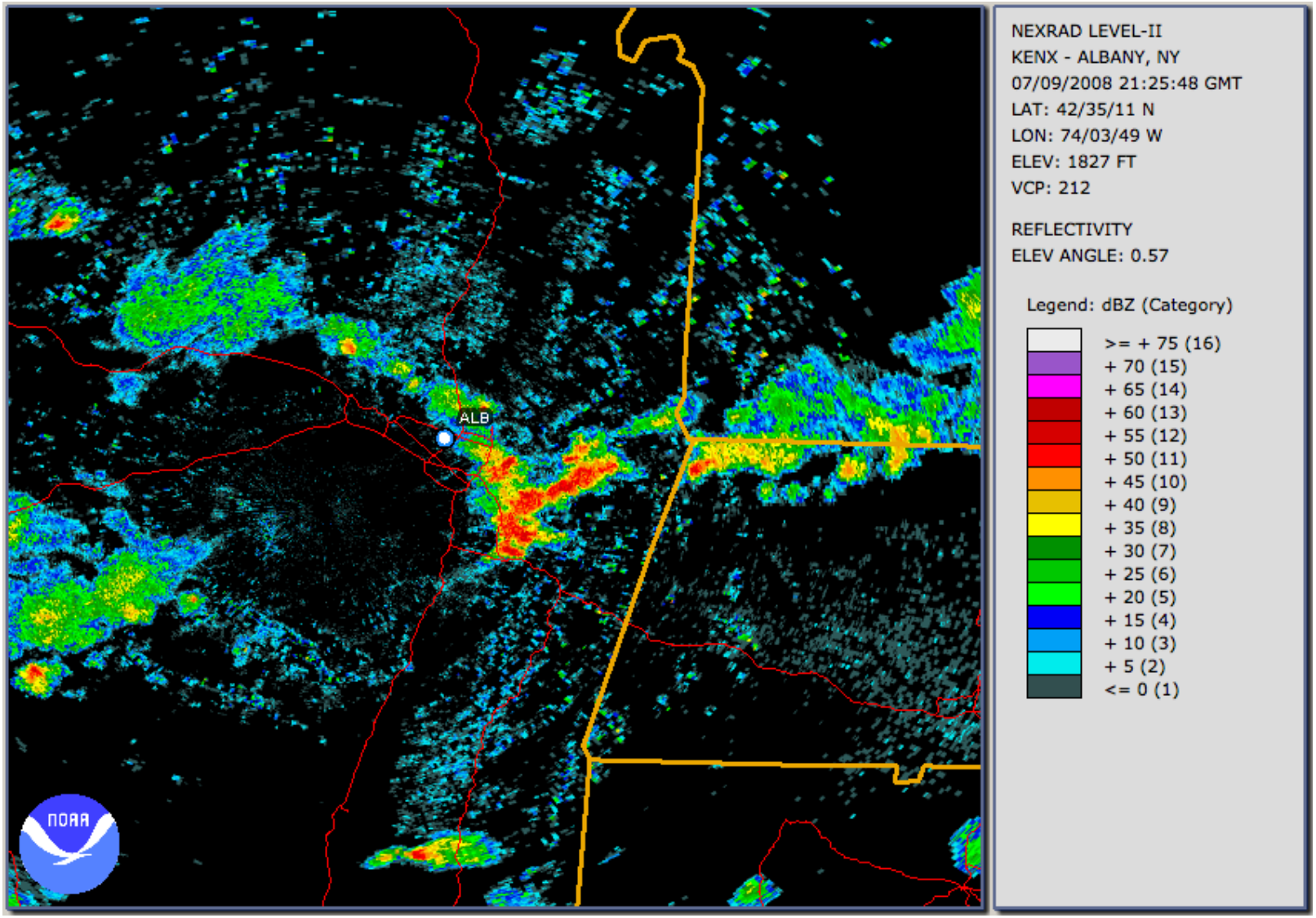
KENX Radar ALB ASOS downtime case
2117 UTC 09 July 2008



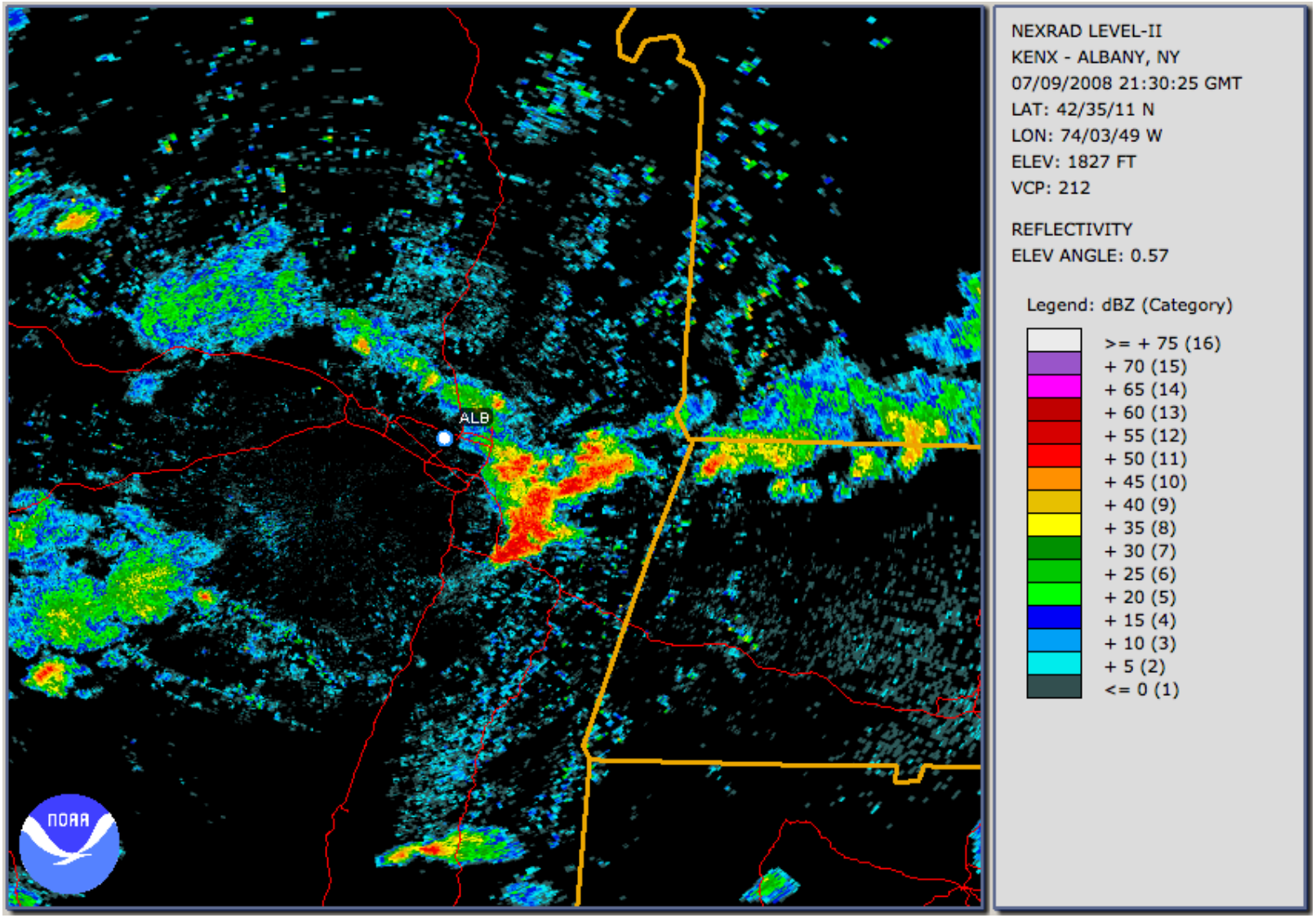
KENX Radar ALB ASOS downtime case
2121 UTC 09 July 2008

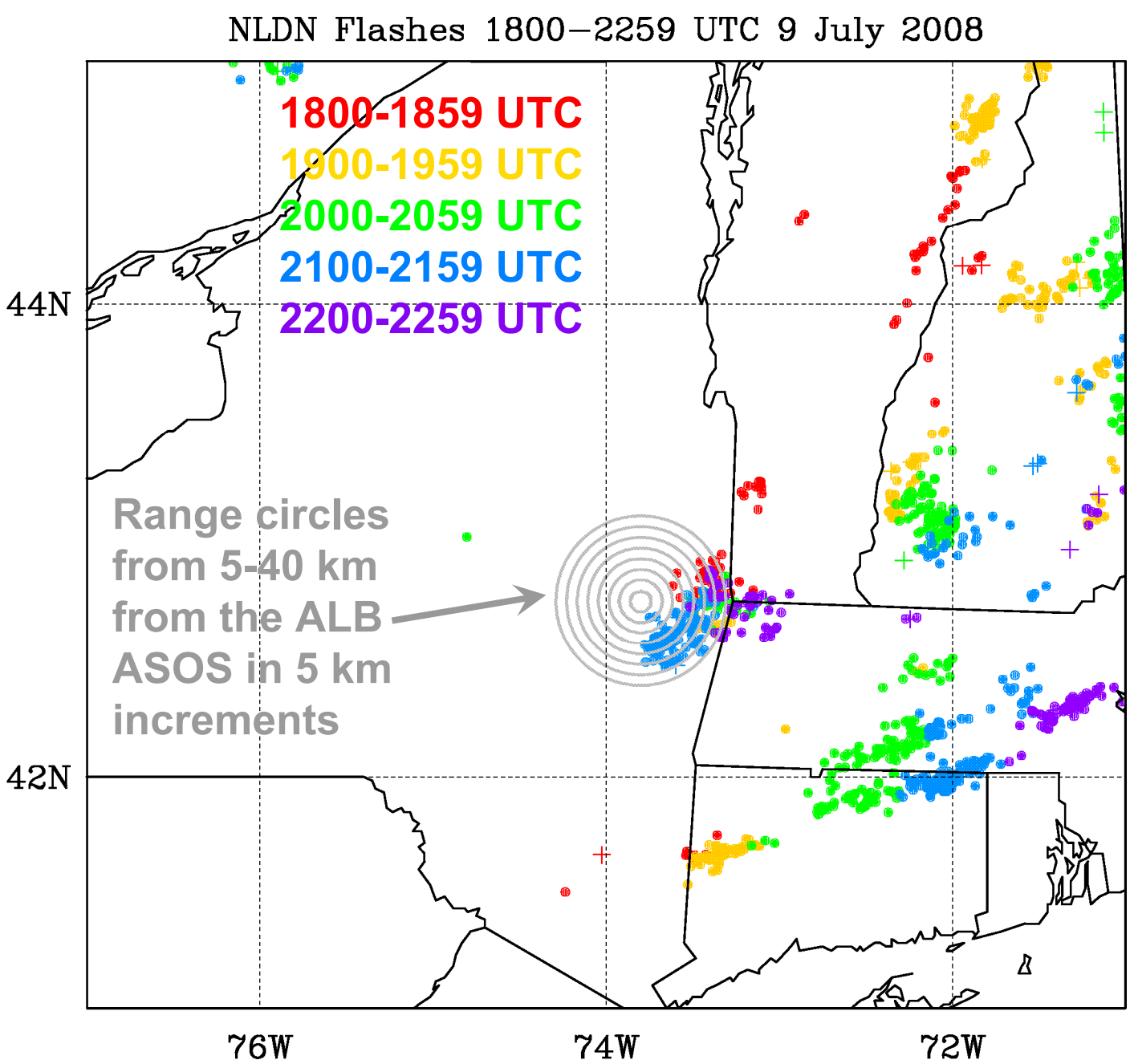


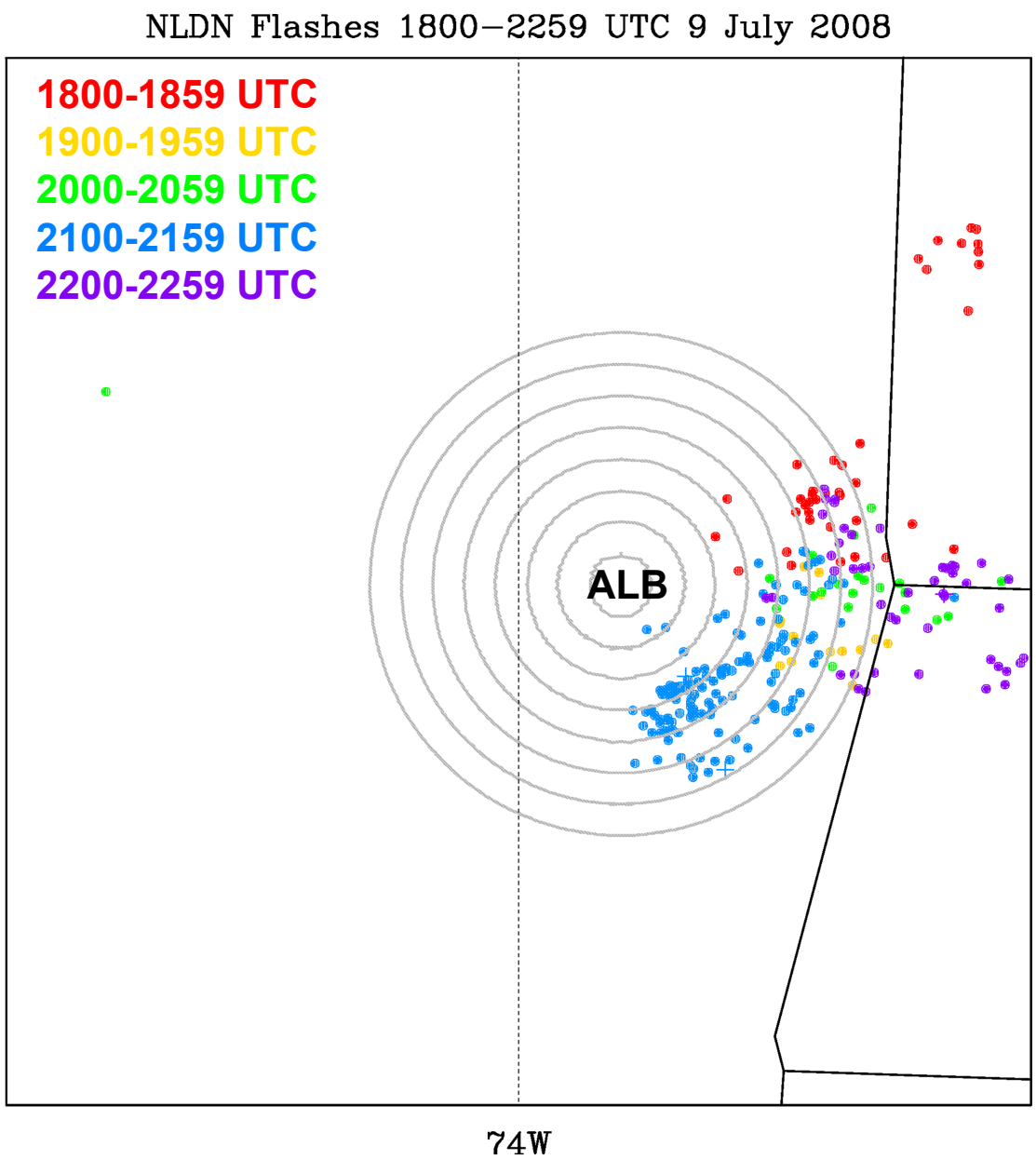
KENX Radar ALB ASOS downtime case
2126 UTC 09 July 2008



KENX Radar ALB ASOS downtime case
2130 UTC 09 July 2008

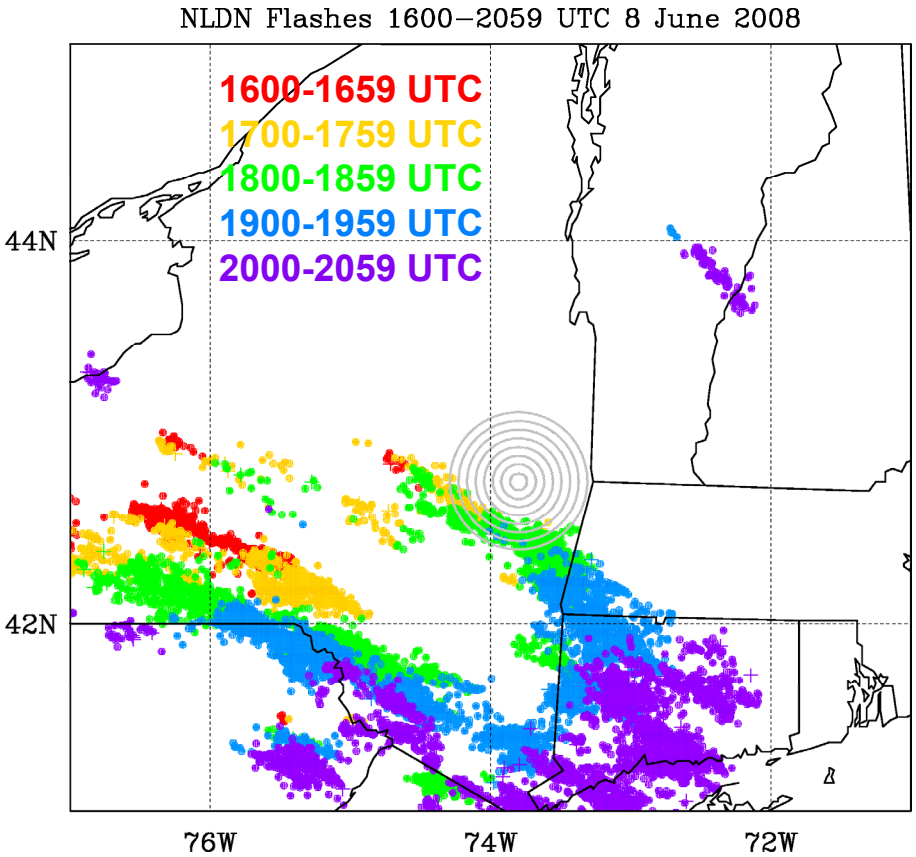


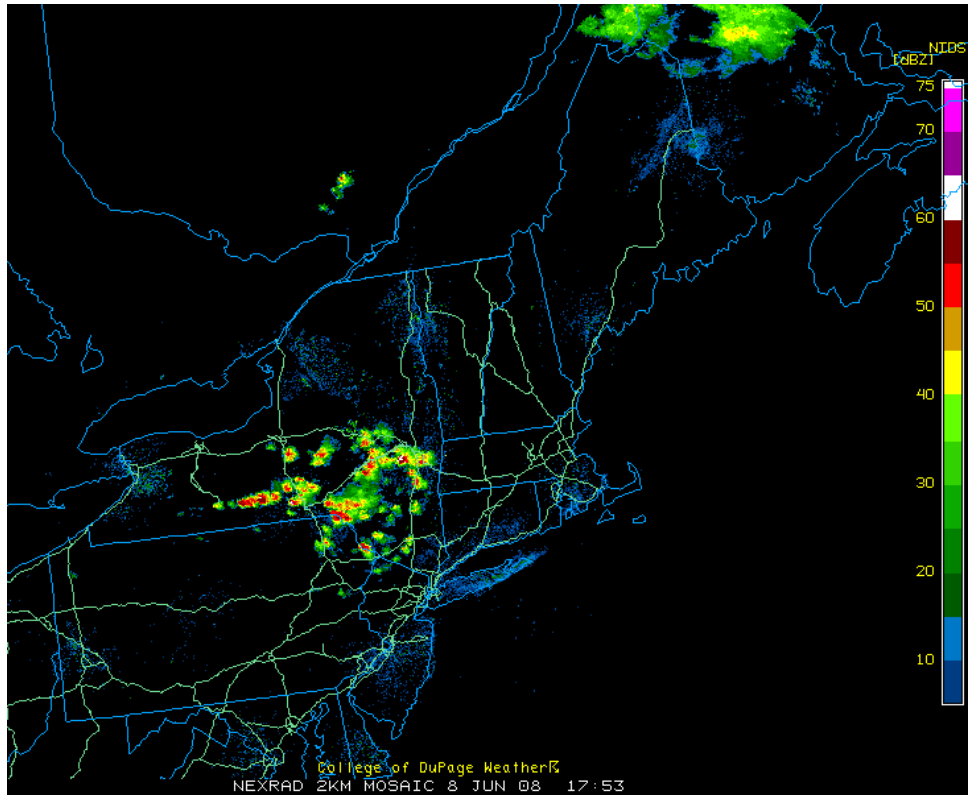

NLDN Flashes 1800–2259 UTC 9 July 2008
1800-1859 UTC
1900-1959 UTC
2000-2059 UTC
2100-2159 UTC
2200-2259 UTC
Range circles
from 5-40 km
from the ALB
ASOS in 5 km
increments
44N
42N
76W
74W
72W



- The NLDN detected 2 flashes within 20 km of the ALB ASOS @ ~1805 UTC and another 19 flashes between 2100 and 2159 UTC.

- A total of ***106*** flashes were detected within 30 km during the ASOS downtime.





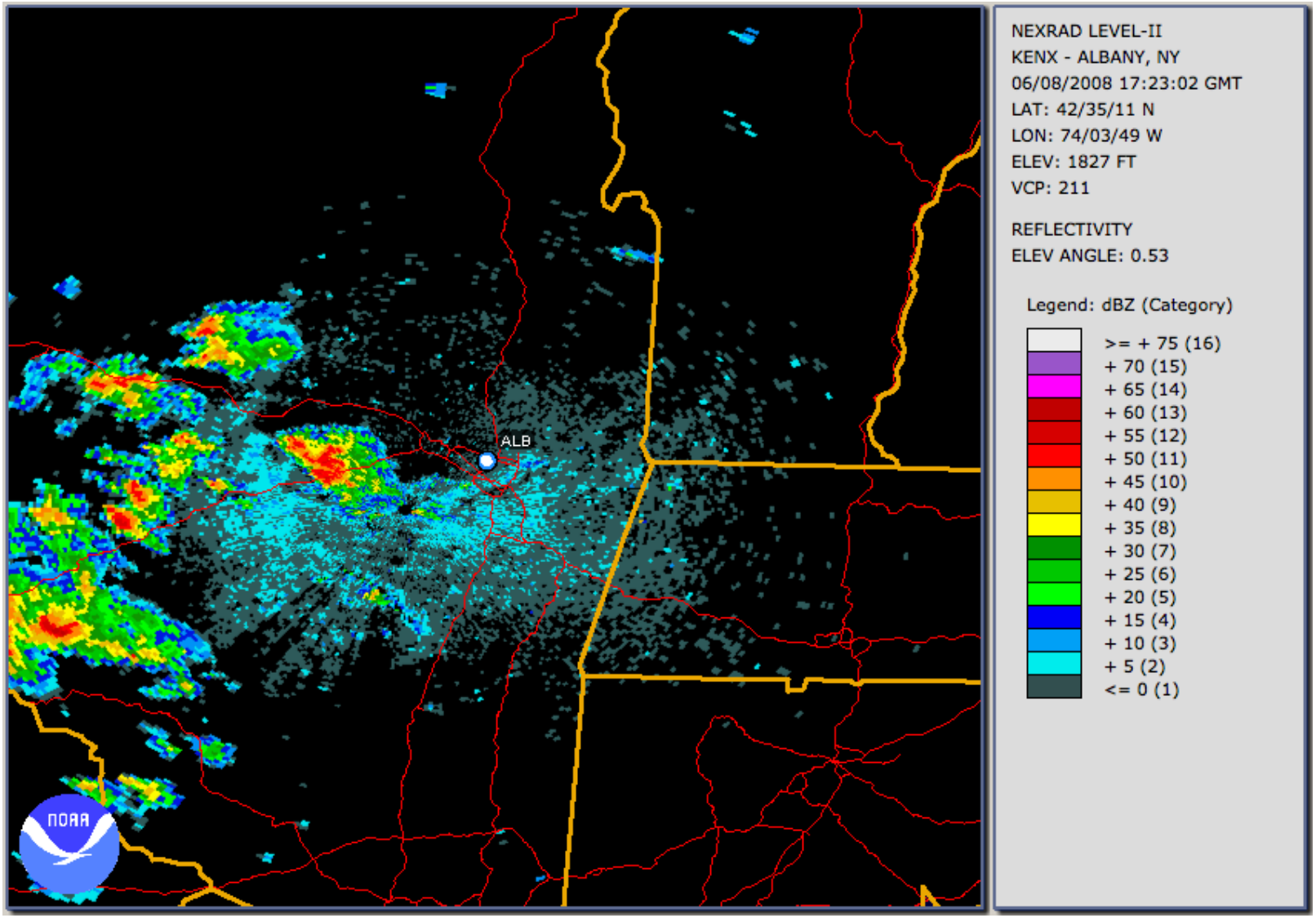
KALB 081651Z 28009KT 7SM FEW055 32/21 A2984 RMK AO2 SLP101 T03220211

KALB 081751Z 35010KT 5SM TS HZ CLR 30/21 A2983 RMK AO2 TSB51 SLP097 TS SW MOV SE T03000211 10328 20244 56013

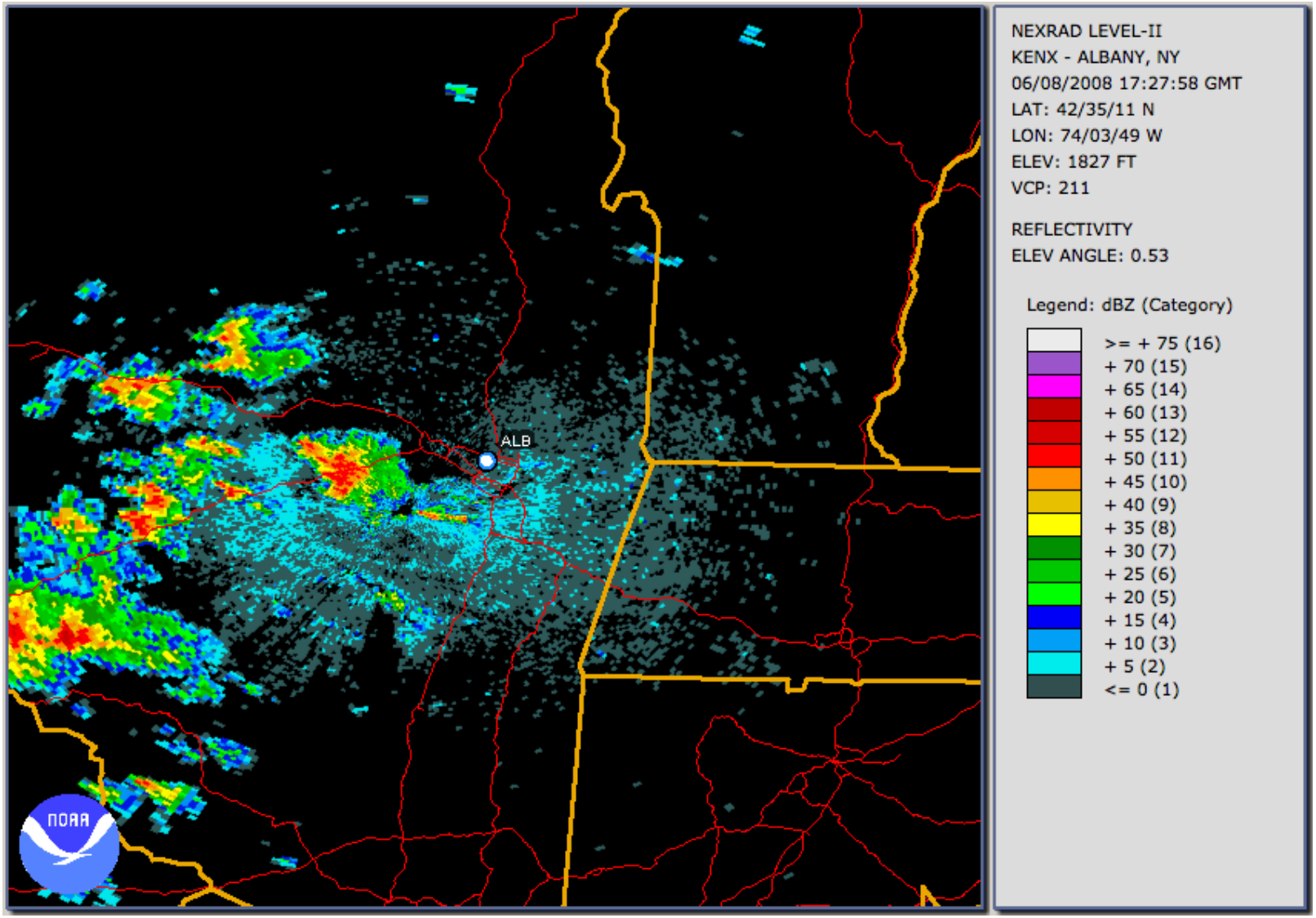
KALB 081821Z 32007KT 6SM HZ FEW044 29/22 A2982 RMK AO2 TSE15

KALB 081851Z 24011KT 7SM CLR 29/22 A2983 RMK AO2 TSE15 SLP099 T02890217

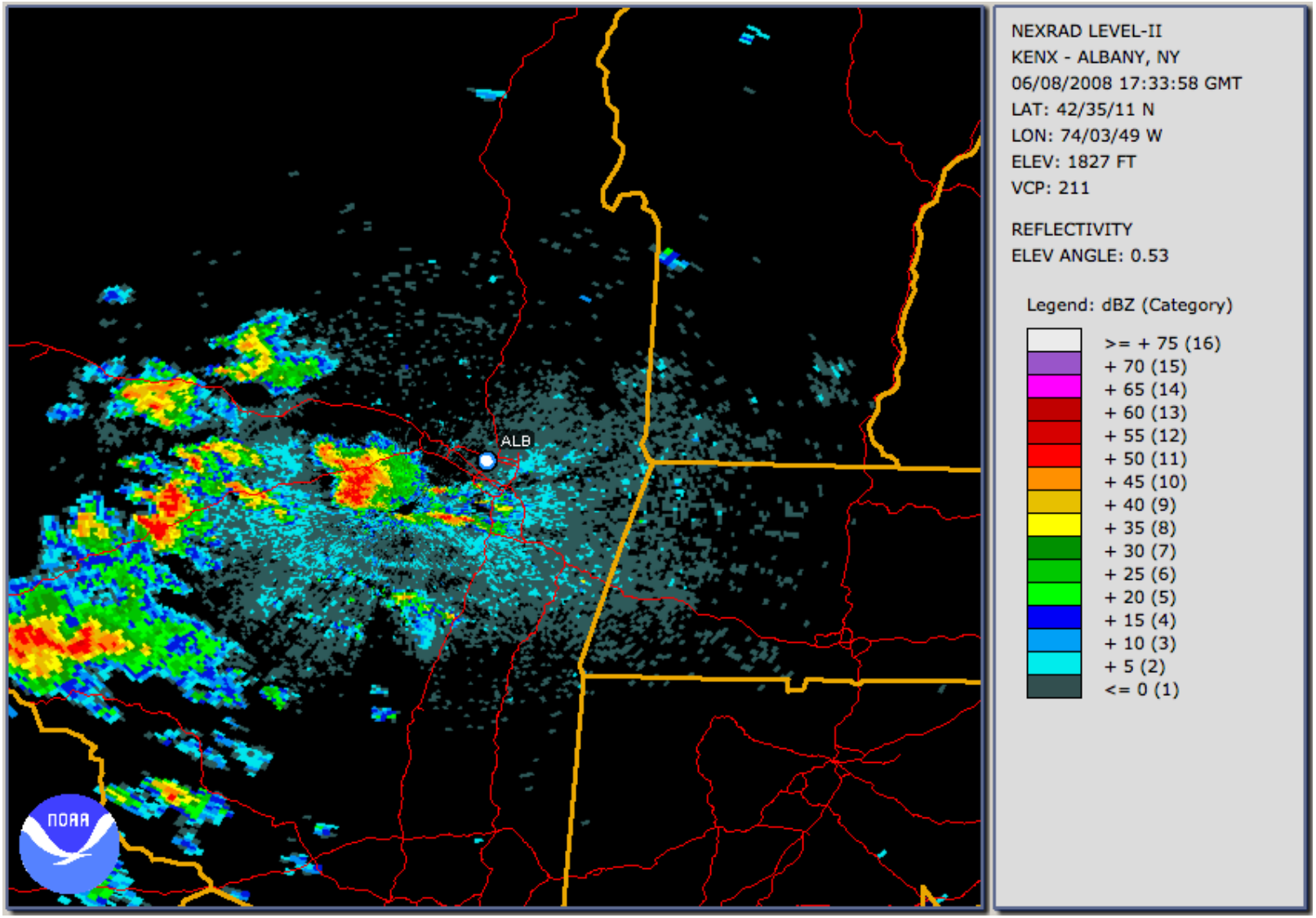
KENX Radar
1723 UTC 08 June 2008



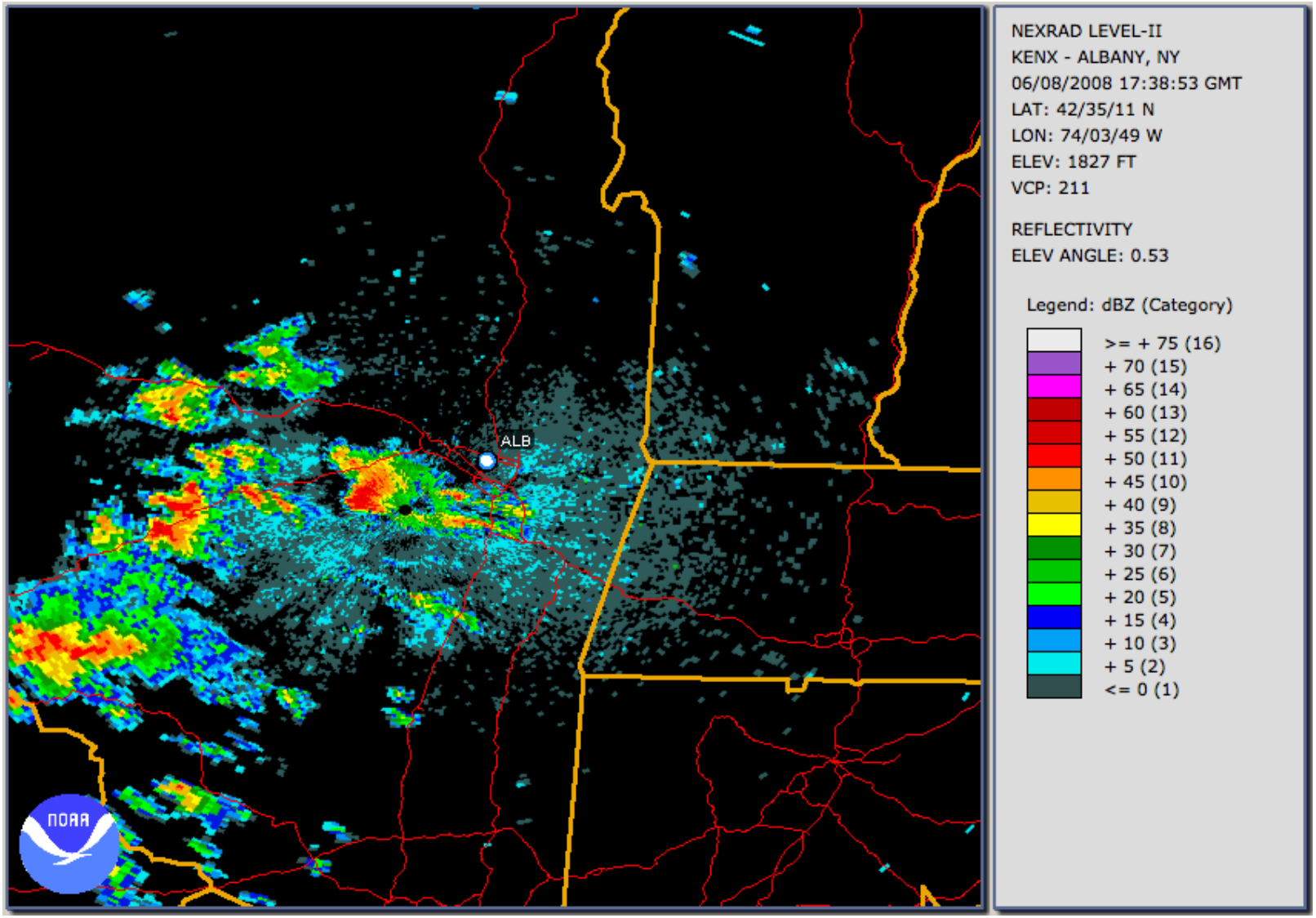
KENX Radar
1728 UTC 08 June 2008



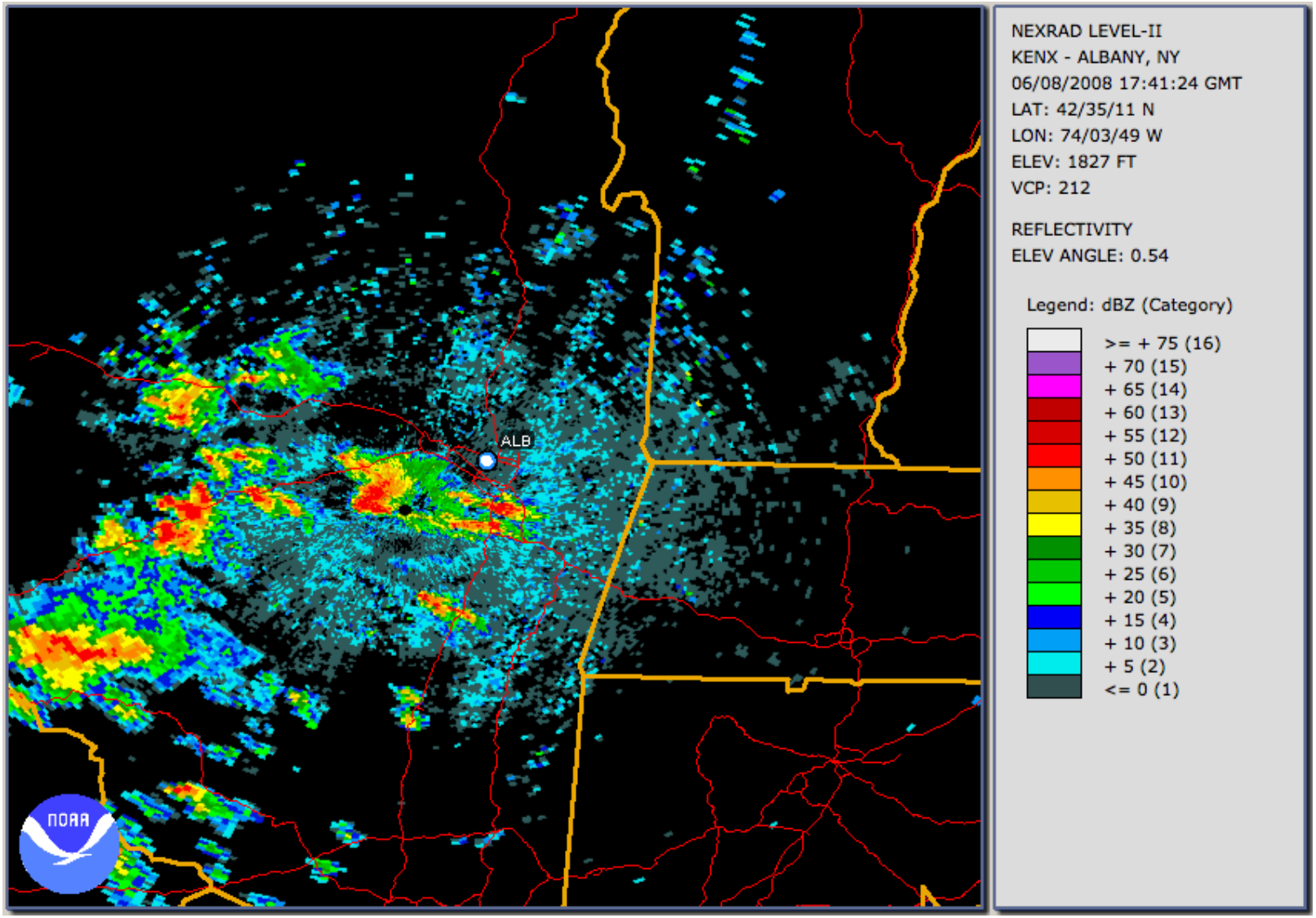
KENX Radar
1734 UTC 08 June 2008



KENX Radar
1739 UTC 08 June 2008



KENX Radar
1741 UTC 08 June 2008



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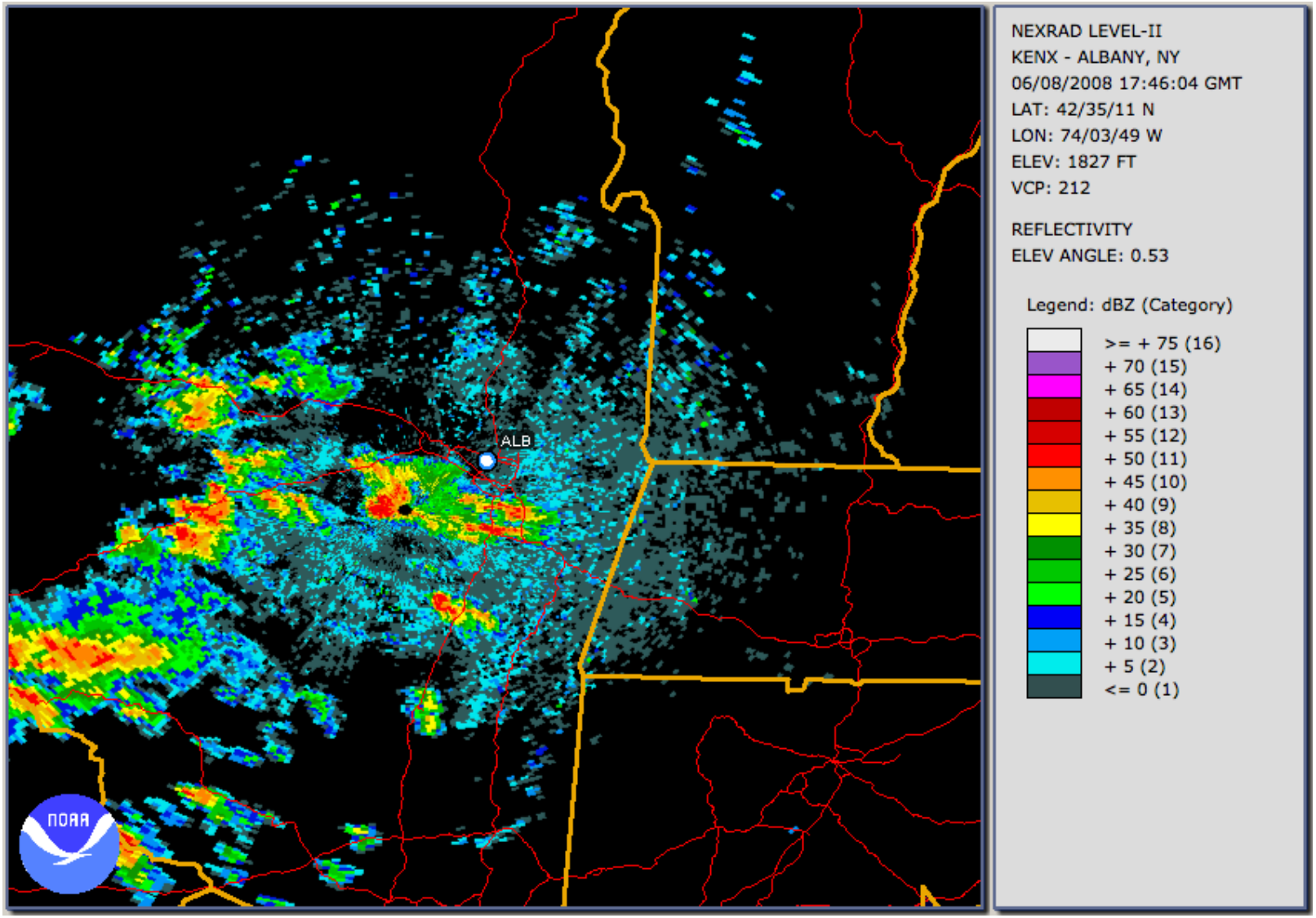

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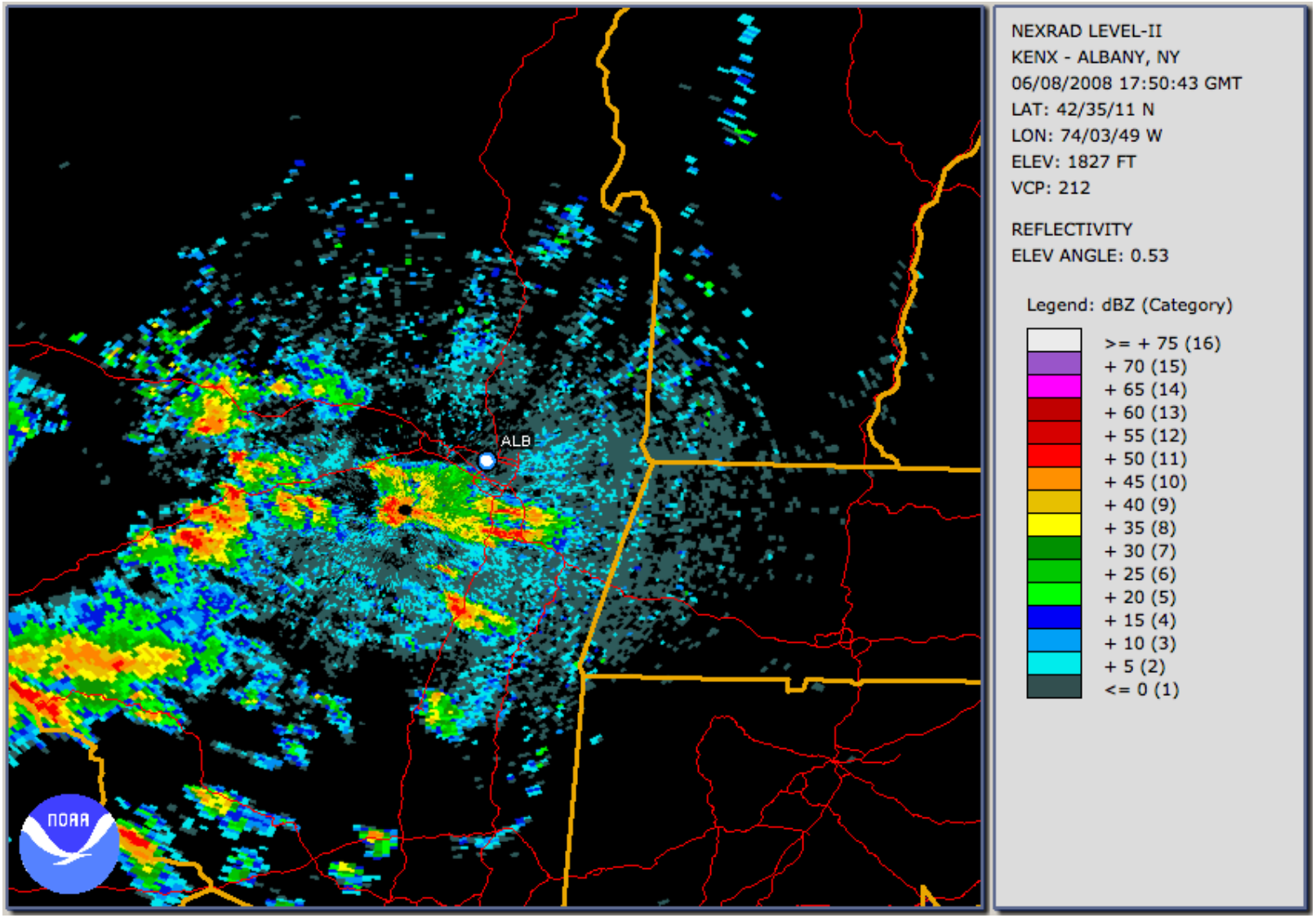
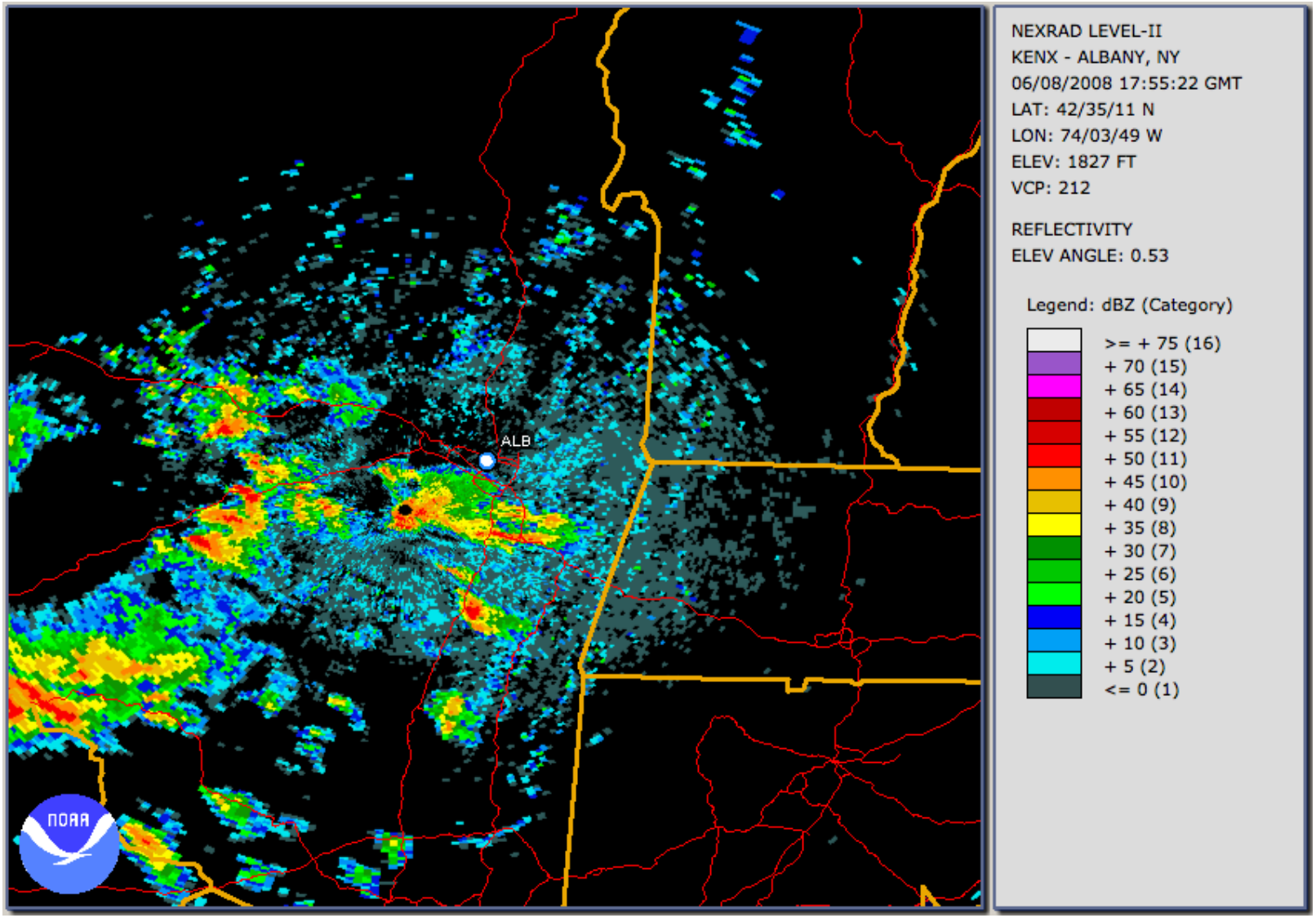
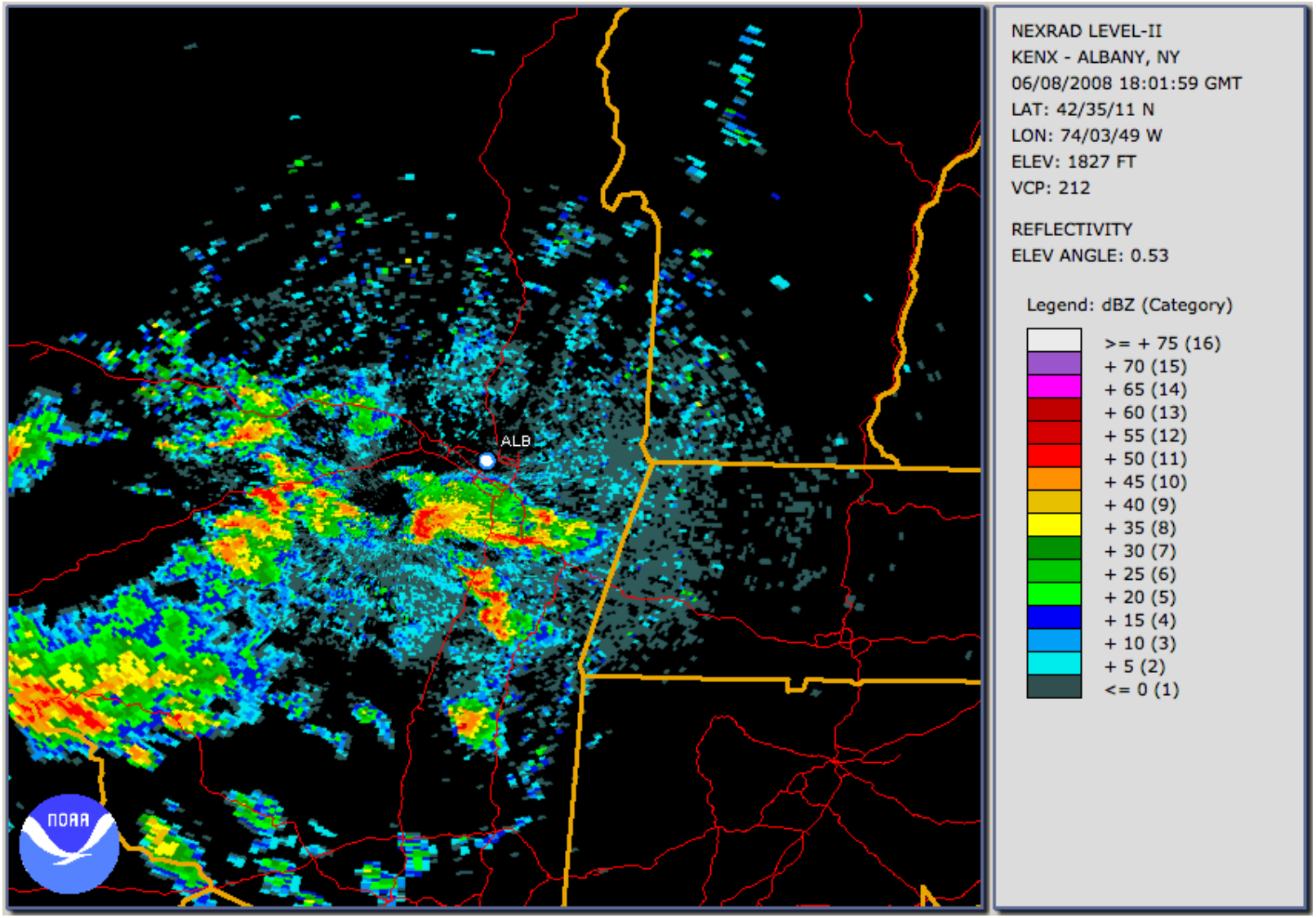


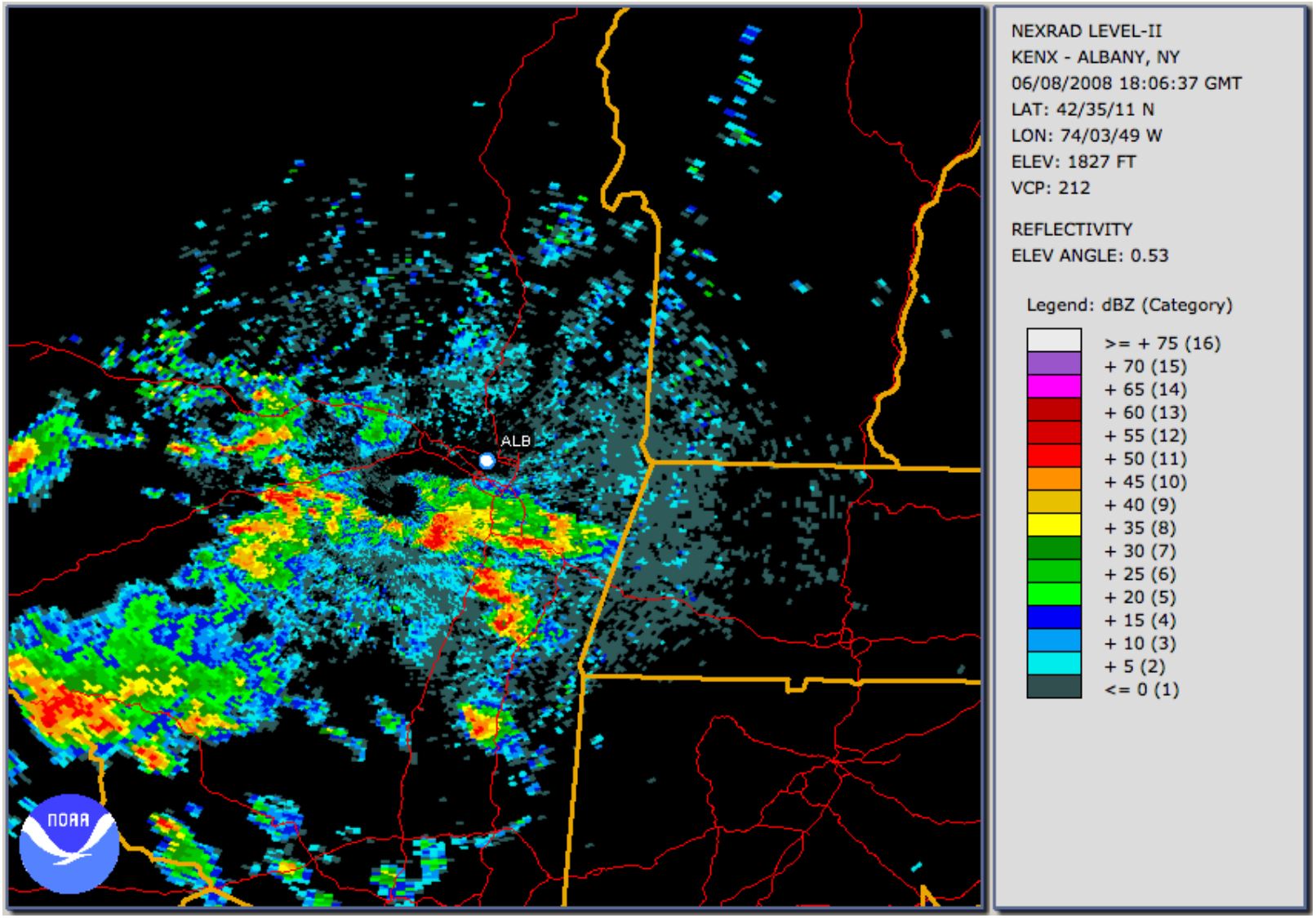
KENX Radar
1755 UTC 08 June 2008



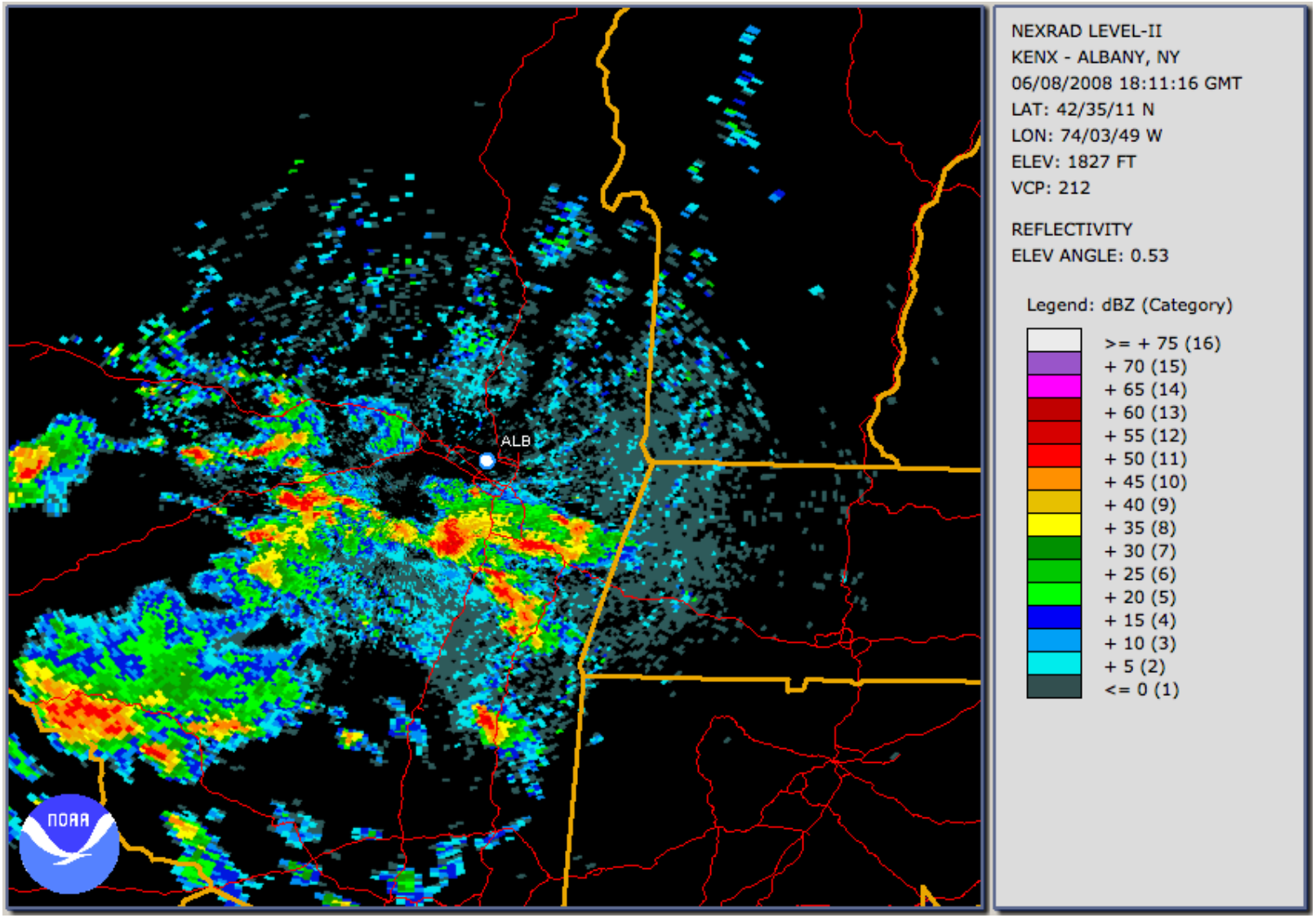
KENX Radar
1802 UTC 08 June 2008



KENX Radar
1807 UTC 08 June 2008



KENX Radar
1811 UTC 08 June 2008



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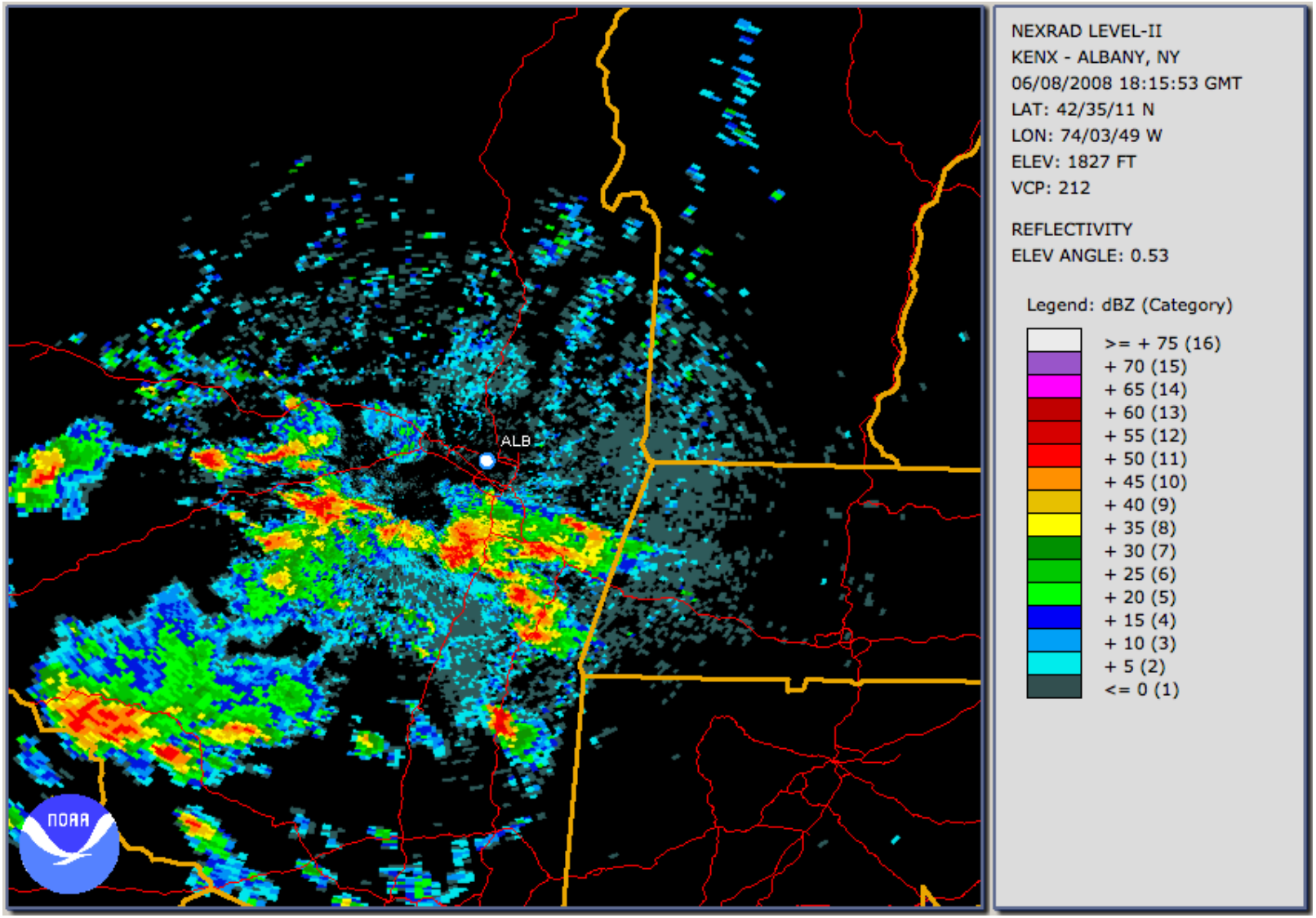
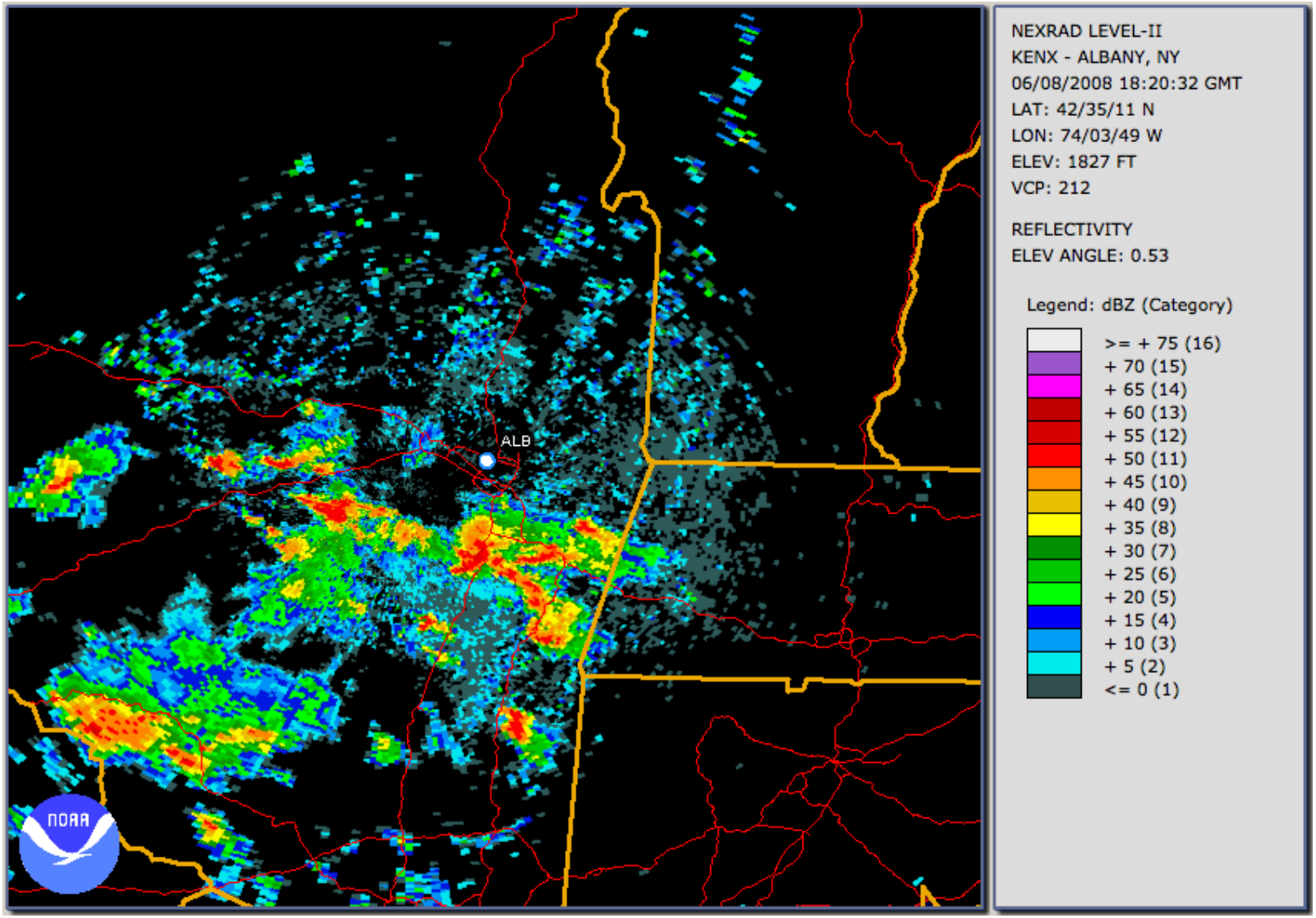
1816 UTC 08 June 2008



KENX Radar
1821 UTC 08 June 2008



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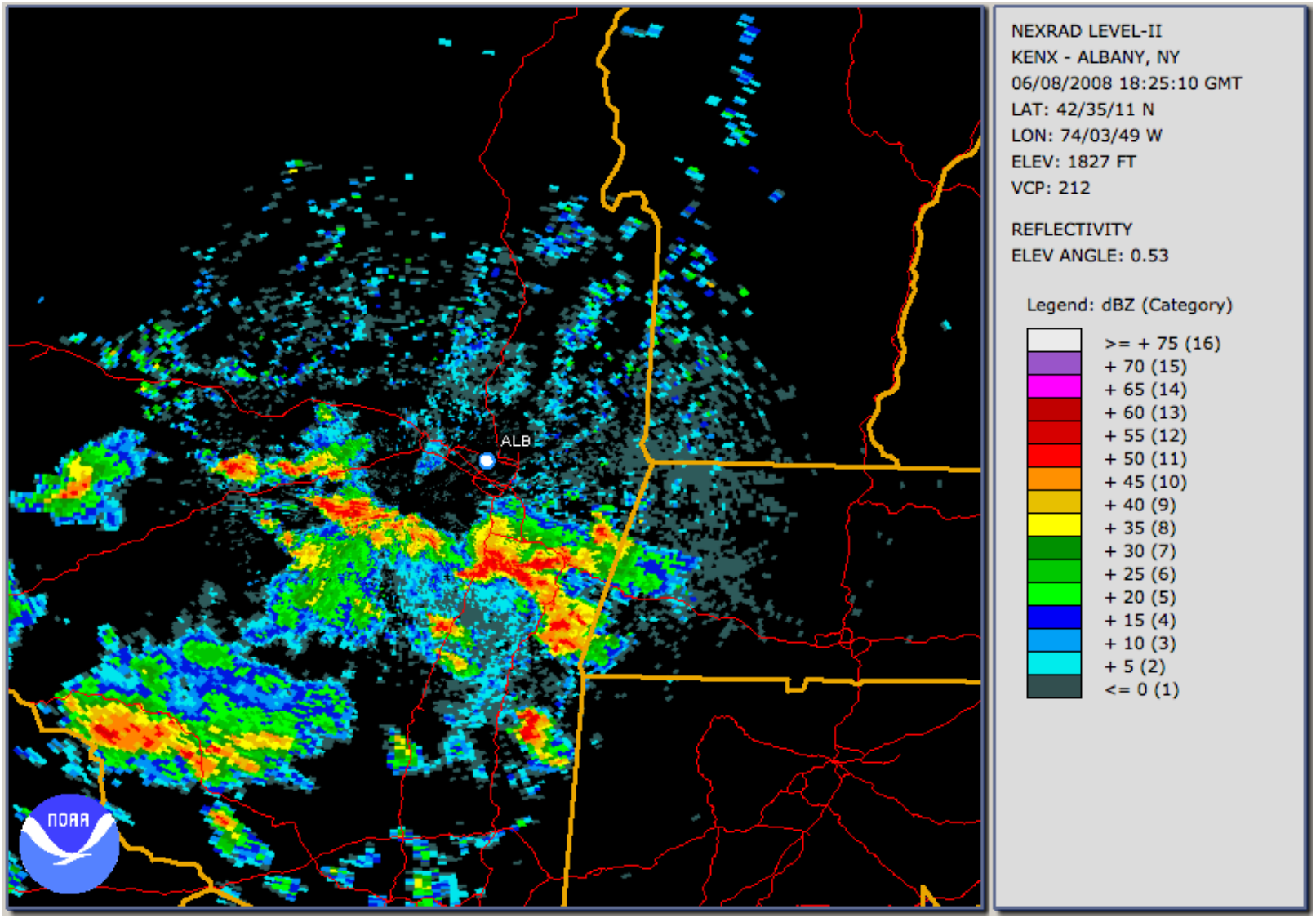
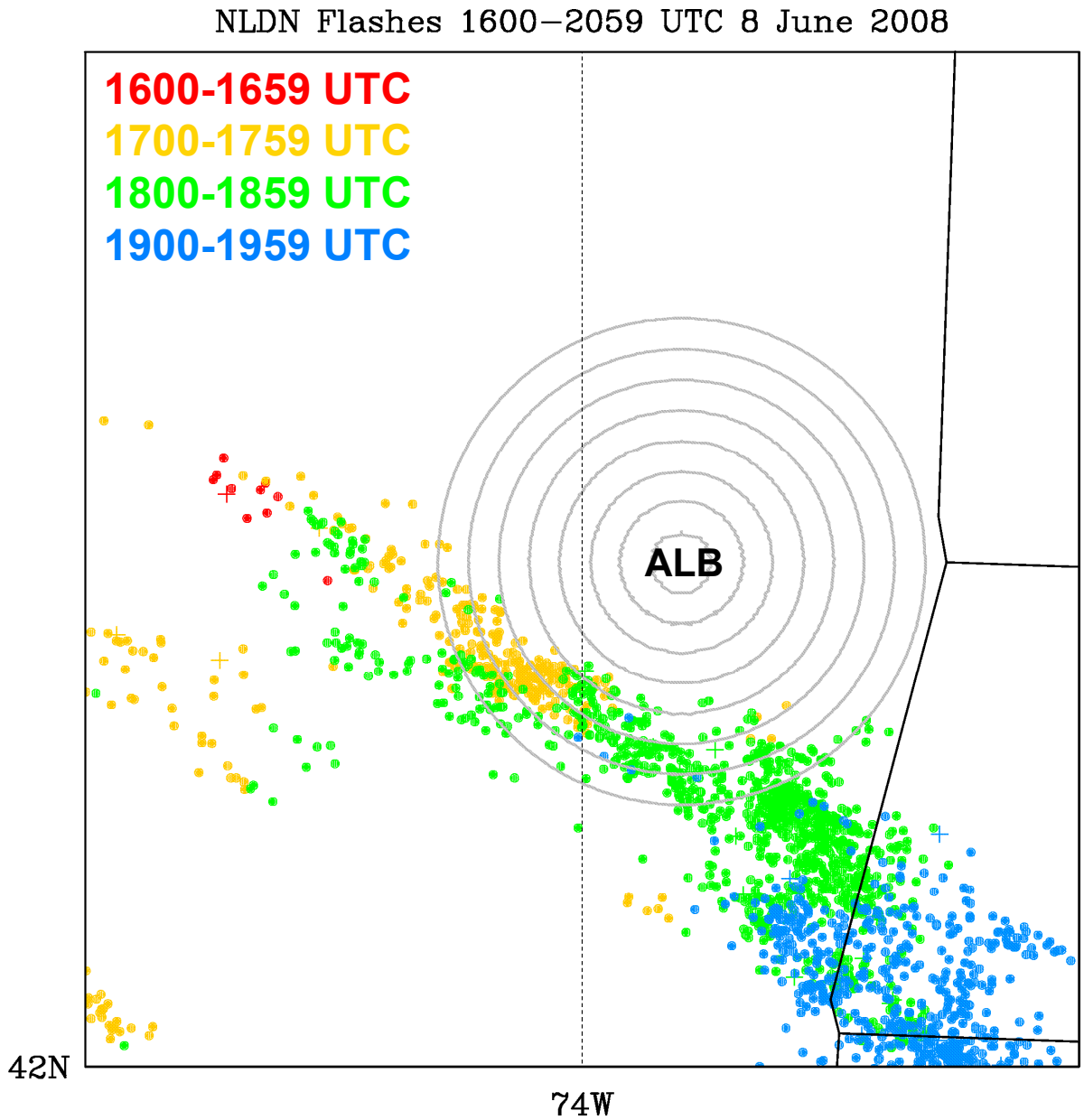
1825 UTC 08 June 2008





- The NLDN detected NO flashes within 20 km of the ALB ASOS!
- Only 6 (25) flashes were detected within 25 (30) km and ±5 min of the TSB report @ 1751 UTC

Summary and Future Work

- A 14 year standard ASOS report climatology of thunderstorm occurrence reveals TPA and DEN as the highest, and ALB and SLC as the lowest, TS reporters

- NLDN flash occurrences best correlate with the ASOS climatology at radial ranges between 10 and 15 km of the ASOS site

- Future work includes calculating JJA flash density maps, an updated evaluation of forecaster skill, examining year to year verification variability and picking on other cities besides Albany