Western Region Technical Attachment
89-09
March 21, 1989

UPDATE: OPERATIONAL USE OF LIGHTNING DATA

As the 1989 convective season approaches, we'd like to review activities during the past few months that are related to the operational use of lightning data.

National

The national lightning graphic, NMCGPHLDS, is now distributed on AFOS four times an hour. Each graphic depicts all positive and negative cloud-to-ground strikes that were registered during the previous 15-minute period. An example of the graphic is shown in Figure 1 (1:1 zoom) and Figure 2 (4:1 zoom). The graphic is similar to the Western Region output since our software was used to generate the product.

Although the national graphic is available more often than the Western Region product, the grid spacing is more coarse. For example, the grid spacing for the comparable half-hourly Western Region graphic, WLS, is 0.2 degrees, while the grid spacing for LDS is 0.5 degrees. The greater temporal resolution of the national graphic may be useful in determining the onset and dissipation of convection activity. We encourage its use, along with the Western Region product suite.

Data for the national graphic is obtained from the networks depicted in Figure 3. The State University of New York at Albany (SUNYA) has been gradually expanding its network westward. The direction finders that determine lightning flash location are similar to those used in the western Bureau of Land Management (BLM) network. By the end of this summer, most of the U.S. will be covered by these direction finders. Lightning flash data is collected from all of the networks by SUNYA, processed and then sent to the National Severe Storms Forecast Center (NSSFC) where the AFOS graphic, LDS, is generated and distributed on AFOS.

Regional

There have been no major changes to the BLM lightning detection network since last year. Additionally, no changes are planned for the Western Region graphics generation software. The suite of lightning products available for AFOS and RTA sites in the Western Region is shown in tables 1 and 2. Please consult the *ALDS User's Guide* for more information and examples of the products.

One product we would like to encourage each office to use is the alert graphic. As explained in the *ALDS User's Guide*, rectangular alert boxes, of any size, can be defined by dialing into the AOS computer at WSFO Boise. For each alert box, the operator can define up to three lightning flash thresholds:

1. Surveillance - Useful in determining the onset of lightning.

2. Total Count - Total flashes in the box during a 30-minute period.

3. Grid Box - Total flashes in each 0.2 degree by 0.2 degree grid box during a 30-minute period. Useful in determining "hot spots".

If any of the above user-defined thresholds are exceeded during a 30-minute period, a graphic is generated and transmitted to the office that set up the alert box. This graphic should be alarmed by the requesting office. An example of how one office uses this feature is shown in Figure 4. WSO Medford has defined one surveillance alert box (largest one) and six smaller alert boxes corresponding to each of their fire weather districts.

NSSFC Evaluation of Lightning Data

During 1988, the NSSFC had access to real-time lightning flash data from the networks shown in Figure 3. This real-time display consisted of a CRT which registered flashes, as they occurred, from across the country. The flashes were color-coded, according to time of occurrence, showing evolution and progression of flash activity. Their experience with this data set was very positive. Even though the NSSFC had access to a real-time display, their comments regarding the usefulness of this data set are applicable to the Western Region and national lightning products as well. Following are some excerpts from the NSSFC evaluation summarizing some of the aspects of thunderstorm forecasting for which lightning data has proven to be a useful tool:

1. Existence of thunderstorms -- The lightning data are extremely useful in determining the existence of thunderstorms in data sparse regions, i.e., the western U.S. and coastal water areas, as well as during marginal convective periods across the country.

2. Initiation of Convection -- NSSFC forecasters found that lightning data often provides the first piece of information about the beginning of convective activity. There were several instances where lightning data showed convection, but radar did not indicate strong convection until 5 to 20 minutes later.

3. Dissipation of Thunderstorms -- The combination of lightning data with diagnostic fields of stability became one of the main tools in determining the end of convection. Frequently, lightning activity will stop, followed in 10 to 20 minutes by a decrease in radar levels, and then followed in 30 minutes or more by a warming of cloud tops in the satellite imagery.

The changeover from negative to positive flashes also appears to be a fairly reliable indicator that convection will start to dissipate in the next 30 minutes.

4. Configuration of Convection -- The lightning data frequently is the first data to show isolated areas of convection forming lines.

5. Coverage -- Satellite data is often a very poor indicator of the precise location of individual convective cells because the cirrus outflow from the thunderstorms tends to obscure active regions within the storms. Lightning data helps locate the thunderstorms within the cirrus cloud shield.

Some of the above points are well-known to Western Region forecasters, but it's noteworthy that in parts of the country with excellent radar coverage, lightning data has also proven to be a useful tool. During the next new months, the Western Region has been asked to take part in the evaluation of all lightning products. Each office has been provided a form to aid in this evaluation. Your comments on the operational usefulness of this data will help determine the direction the NWS takes in implementing a national lightning detection network.

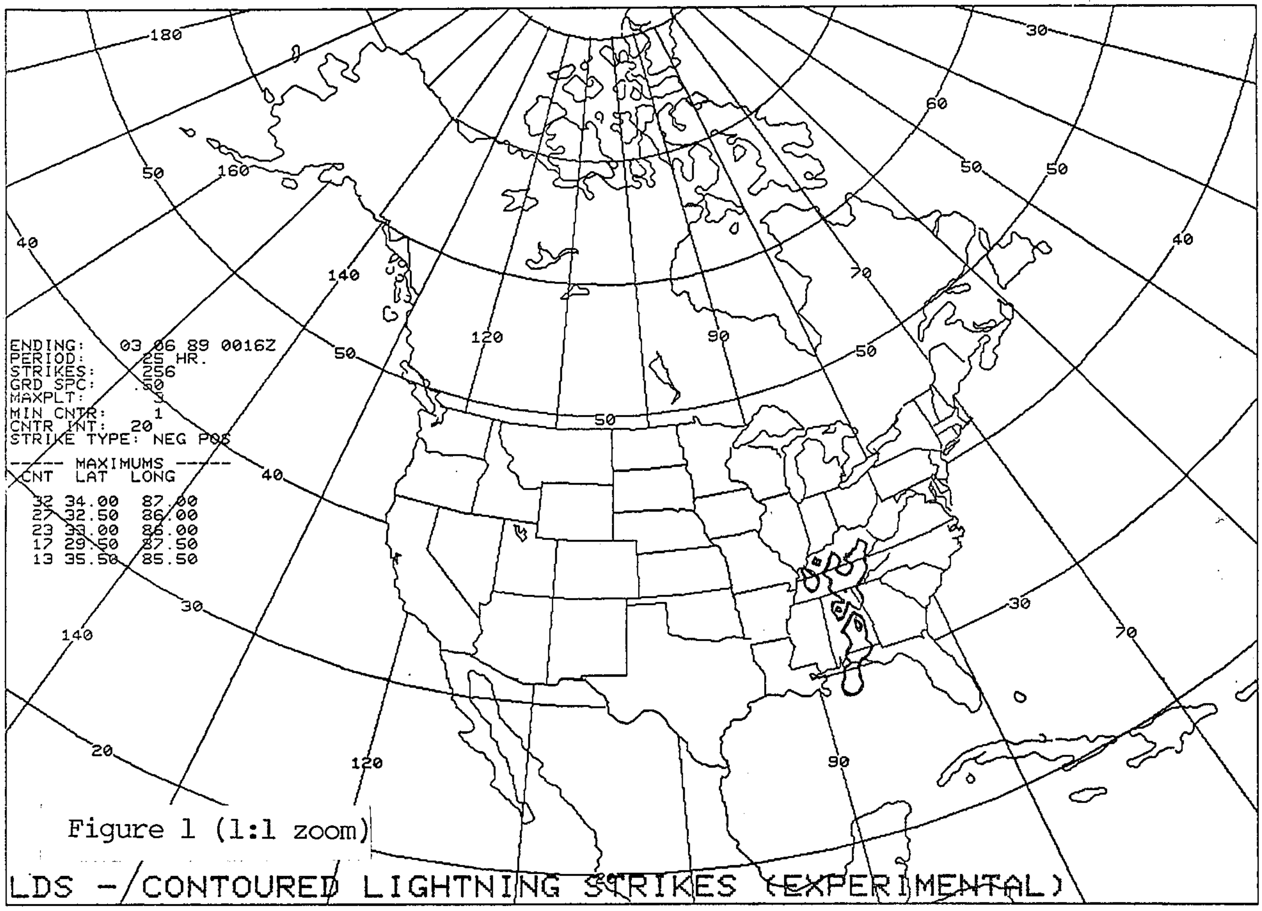

Figure 1 (1:1 zoom)

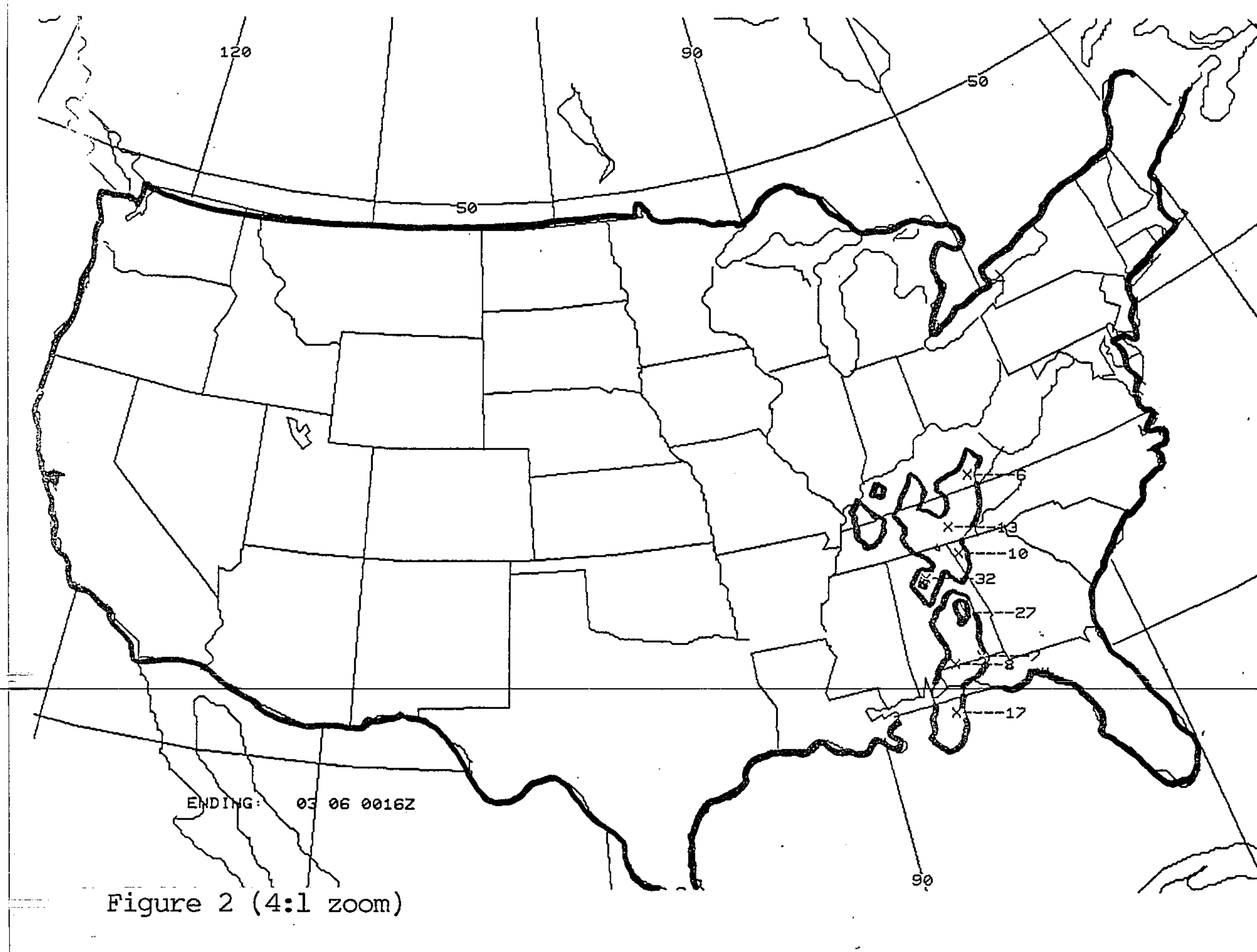

Figure 2 (4:1 zoom)

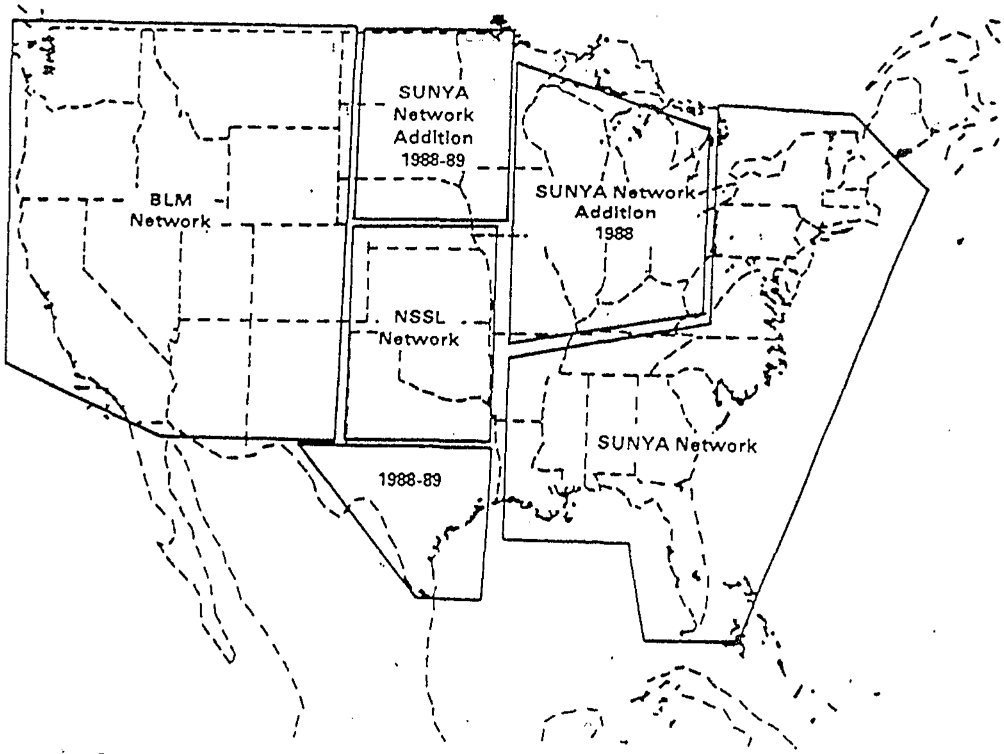

Figure 3 Experimental national lightning detection network.

ALERT BOXES DEFINED FOR MFR

BOX	TCT	GBT	SMT	SMH	AREA NAME
1	300	40	2	3.0	FIRE WX DISTRICT
2	25	15	---	---	ZONE 607
3	25	15	---	---	ZONE 612
4	25	15	---	---	ZONE 613
5	25	15	---	---	ZONE 614
6	25	15	---	---	ZONE 611
7	25	15	---	---	ZONE 623

TCT = Total Count Threshold
GBT = Grid Box Threshold
SMT = Surveillance Count Threshold
SMH = Surveillance Reset Time

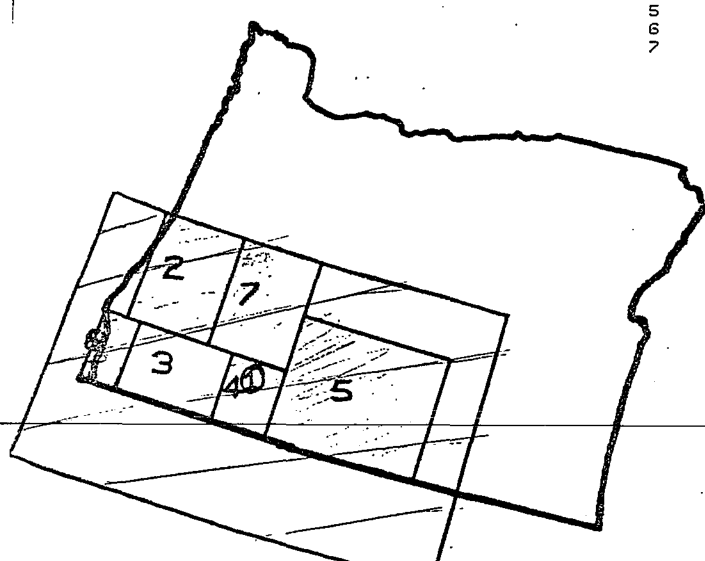

Figure 4

ALDS LIGHTNING STRIKES - ALERT BOXES

MFR

NWS_BOI_CP

Chart Time Schedule for AFOS Products

Product Type	Strike Types	AFOS CCCNNNXXX	AFOS ROUTING
30-minute contoured	NEG, POS	NMCGPHWLS	CSW
30-minute individual	POS	NMCGPHWLR	CSW
3-hourly contoured	NEG, POS	NMCGPHWLN	CSW
24-hourly contoured	NEG, POS	NMCGPHWLO	CSW
72-hr. count vs. time	NEG, POS	NMCGPHWLP	CSW
7-day contoured	NEG, POS	NMCGPHWLO	CSW
7-day count vs. time	NEG, POS	NMCGPHWLP	CSW
Alarm/Alert Graphic	NEG, POS	NMCGPHWLQ	specific site

Product Type	Product Schedule
30-minute contoured	every 30-minutes at 15 and 45 minutes past hr.
30-minute individual	every 30-minutes at 15 and 45 minutes past hr.
3-hourly contoured	0115 0245 0415 0545 0715 1015 1315 1615 1915 2215 2345z
24-hourly contoured	0015 1215z
72-hr. count vs. time	0315 1145 1945z
7-day contoured	1045z
7-day count vs. time	1345z
Alarm/Alert Graphic	as needed at 15 and 45 minutes past hr.

Table 1

Chart Time Schedule for RTA Products

Product Type	Strike Types	AFOS CCCNNNXXX	AFOS ROUTING
30-minute regional	NEG, POS	BOIFWMWLS	CSW
24-hourly regional	NEG, POS	BOIFWMWLS	CSW
Alarm/Alert Warning	NEG, POS	WRGADAMSG	specific site

Product Type	Product Schedule
30-minute regional	every 30-minutes at 15 and 45 minutes past hr.
24-hourly regional	0045 1245z
Alarm/Alert Warning	as needed at 15 and 45 minutes past hr.

Product Type	Area Covered	
30-minute regional	30 - 50 N.	125 - 105 W.
24-hourly regional	30 - 50 N.	125 - 105 W.
Alarm/Alert Graphic	as specified by user	

Table 2