J1.2

USES OF LIGHTNING DATA BY US GOVERNMENT AGENCIES

Joseph Facundo
NOAA, National Weather Service, Silver Spring, Maryland
Michael Carelli
NOAA, National Weather Service, Silver Spring, Maryland

J1. INTRODUCTION

On January 13, 2005 the National Weather Service (NWS) within NOAA signed a contract for lightning data with Vaisala, Inc. Although this is a NWS contract, any Federal Government agency requiring lightning data may obtain the data through it. This paper will describe some of the uses of lightning data by these agencies.

J2. CONTRACT PROVISIONS

NWS's contract allows the Federal Government to obtain real-time cloud-to-ground lightning data from the 48 contiguous states and for 500 kilometers offshore and over adjacent land areas, i.e. Canada and Mexico. The contract also contains options for long rang marine data from the Atlantic and Pacific Oceans, in-cloud lightning, vendor-generated lightning products, and vendor archived data. The contract is very flexible in terms of costing the various options. It allows participating agencies to obtain data from the entire 48 states, from an individual state, or from any of four different sized sectors. An agency may select the data and geographic coverage it needs to accomplish its mission.

The contract defines five levels of lightning data products; two levels of contractor produced data products and three for Government developed products. The levels are:

Level 1 – Contractor-produced lightning data unchanged in any way.

Level 2 – Contractor-produced products containing lightning data.

Level 3 – Government-generated product repackaging lightning data but not changing the data content.

Level 4 – Government-generated products integrating lightning data with other data sets to produce a new product. The new product may identify detected lightning or areas of lightning activity.

Corresponding author address: Joseph Facundo NOAA, National Weather Service, 1325 East West Highway, OPS22, Silver Spring, Maryland, 20910

Level 5 – Government-generated products using lightning data as an input. These products do not display detected lightning or areas of lightning. Note the original lightning data cannot readily be extracted from Level 5 products.

The Government has different redistribution and archival rights to the different data levels as shown in Figure 1.

J3. LIGHTNING DATA COMMUNIACTIONS

The Government uses three communications methods to transmit lightning data products from the vendor to the Government agencies.

1. The vendor transmits via streaming technology the data directly to the agency through a serial satellite link. Data may be transmitted direct to the user sites or transmitted to a receiver site that retransmits the data to the user sites.
2. A one-minute product packaging lightning data is transmitted through a dedicated T1 line from the vendor to the NWS Telecommunication Gateway. The Telecommunication Gateway retransmits the product to the user sites through the NOAAPORT Broadcast.
3. The vendor transmits the data to a Government contractor which retransmits the data to the Government agency. The contractor may also repackage the data.

Figure 2 describes in a graphical form the lightning data communications from the vendor to the various user agencies.

J4. PARTICIPATING GOVERNMENT AGENCIES

Several agencies obtain lightning data through the NWS's contract as described above. The uses of lightning products by these agencies are discussed below. They are currently participating in the lightning data acquisition contract but the contract is available to any other Federal Government agency wishing to participate. For further information contact Michael Carelli, NOAA. National Weather Service,

Silver Spring, Maryland, 301-713-2093, extension 115 or email at:

michael.carelli@noaa.gov

J4.1 NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

NWS Weather Forecast Offices, River Forecast Centers, and National Centers receive the one-minute lightning product through the NOAAPORT Broadcast. The Storm Prediction Center and Aviation Weather Center also receive data directly from the vendor through satellite links. These sites use the data operational to support their mission of producing weather and hydrological forecasts and warnings.

In addition to lightning data from the 48 states, the Aviation Weather Center receives the long range marine data from the North Pacific, North Atlantic, and Gulf of Mexico/Caribbean Sea. This data is used to generate an aviation chart of lightning data overlaid on satellite imagery. Figure 3 is an example of this chart showing data from the North Atlantic and Gulf of Mexico/Caribbean Sea.

The National Environmental Satellite and Data Information Service's Synoptic Analysis Branch also receives the one-minute product through NOAAPORT and uses it to support NWS operations. The National Climatic Data Center within NOAA receives and archives the one-minute product.

J4.2 BUREAU OF LAND MANAGEMENT (BLM)

The BLM receives streaming lightning data at the National Interagency Fire Center in Boise Idaho. From the Interagency Fire Center the data is disseminated via the IAMS system to the wildland fire management community. IAMS is a password-protected, internet-based system. Agencies receiving data include the US Forest Service, National Park Service, Fish and Wildlife Service and cooperating state and local government fire management agencies. The Interagency Fire Center also disseminates lightning data to the Bureau of Indian Affairs through land line connections.

The wildland fire management community uses lightning data to support ongoing fire fighting operations and to determine areas where lightning strikes may have ignited fires.

J4.3 DEPARTMENT OF DEFENSE (DOD)

Within the DOD both the Army and Air Force receive lightning data.

Several Army test sites receive the one-minute product through the NOAAPORT Broadcast. These facilities enter the data into their 4DWX systems for operational use. The data is used improve safety during testing and to ensure the safe handling and storage of munitions.

The US Air Force Weather Agency receives streaming lightning data directly from the vendor at several Air Force Bases and US Army Bases where Air Force units support army operations. These sites use the data to issue forecasts and warming for military bases and for aircraft in-flight support. The data is also used to protect troops and assets on the ground.

J4.4 NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

The Marshall Space Flight Center receives streaming lightning data directly from the vendor. Marshall's Global Hydrology and Climate Center uses the data in its research and development programs.

The Space Flight Meteorology Group (SMG) at the Johnson Space Flight Center receives the one-minute lightning product through the NOAAPORT Broadcast and also receives lightning data from a NASA contractor. The NASA contractor receives the data directly from the vendor. The SMG uses lightning data operationally when provide forecasts for space flight launch and recovery operations for go/no-go decision support.

J4.5 FEDERAL AVIATION ADMINISTRATION (FAA)

The FAA's ARTCCs, TRACONs, and towers receive a five-minute lightning data product through ETMS. The lightning data vendor transmits lightning data to an FAA contractor who retransmits the data to the Volpe National Transportation Systems Center. The Volpe Center stores the data in a single file and every five minutes distributes it through their ETMS to the FAA sites. The sites display the data using the ETMS's Traffic Situation Display. The data is used to ensure aircraft safety both enroute and in the terminal area.

Lightning data is ingested into the FAA's WARP system through an FAA contractor which receives the data from the vendor.

The FAA uses lightning data to indicate thunderstorms in the ASOS and AWOS surface observations. The NWS Telecommunication Gateway transmits the one-minute product to the

FAA's ADAS systems at the ARTCCs. If lightning data is detected in the vicinity of an ASOS or AWOS site the ADAS transmits a "T" to the site. The "T" is then appended to the surface observations indicating a thunderstorm is occurring.

J5. CONCLUSION

The lightning data acquisition contract signed by the NWS in January 2005 allows any Federal Government agency to receive the lightning data it needs. The contract is extremely flexible allowing participating agencies to receive the real-time and archived data from any area of the 48 contiguous states as well as long range marine data

J6. ACKNOWLEDGEMENTS

The authors would like to thank Bing Gong of the Volpe National Transportation System Center and Alan Nierow of the FAA for their input into this paper.

Level 1 Data – Contractor-produced lightning data unchanged in any way Redistribution Rights – Government may not redistribute Level 1 data other than to the participating agencies Archiving Rights – Government may archive Level 1 data only if the vendor does not maintain an archive of the data
Level 2 – Contractor-produced products containing lightning data Redistribution Rights – Government may not redistribute Level 2 data other than to the participating agencies Archiving Rights – Government may not archive Level 2 data
Level 3 – Government-generated product repackaging lightning data but not changing the data content Redistribution Rights – Government may not redistribute Level 3 data other than to the participating agencies Archiving Rights – Government reserves the right to archive Level 3 data but the archived data may not be redistributed other than to participating agencies
Level 4 – Government-generated products integrating lightning data with other data sets to produce a new product; the new product identifies detected lightning or areas of lightning Redistribution Rights – Government may not redistribute Level 4 data other than to the participating agencies Archiving Rights – Government reserves the right to archive Level 4 data but the archived data may not be redistributed other than to participating agencies
Level 5 – Government-generated products using lightning data as an input; the products do not display detected lightning or areas of lightning; the original lightning data cannot readily be extracted from the products Redistribution Rights – Government may freely redistribute Level 5 data to any user Archiving Rights – Government may archive Level 5 data and freely redistribute the archived data to any user

Figure 1 – Lightning Data Levels and Government Redistribution and Archiving Rights

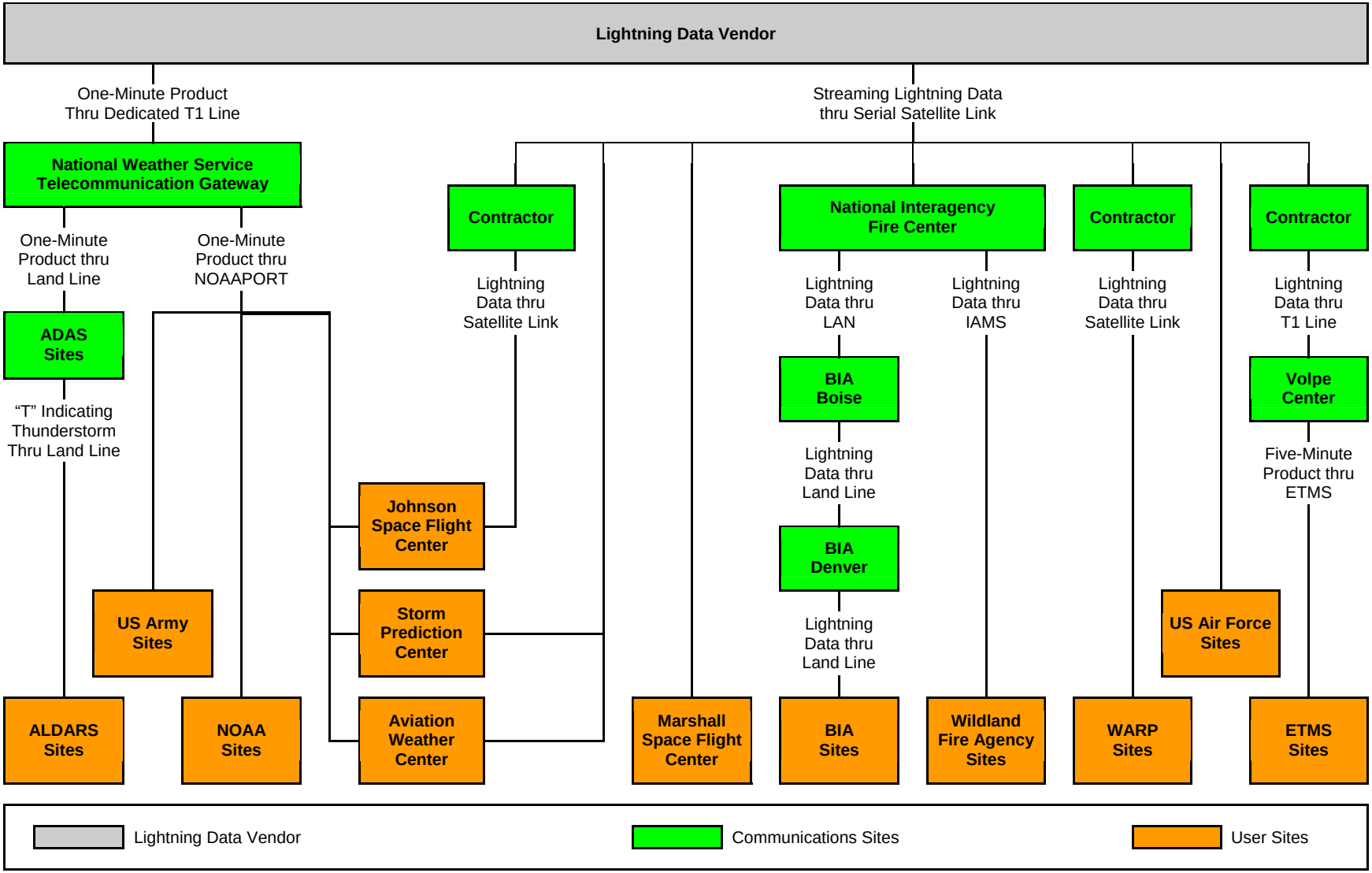

Figure 2 – Lightning Data Communications

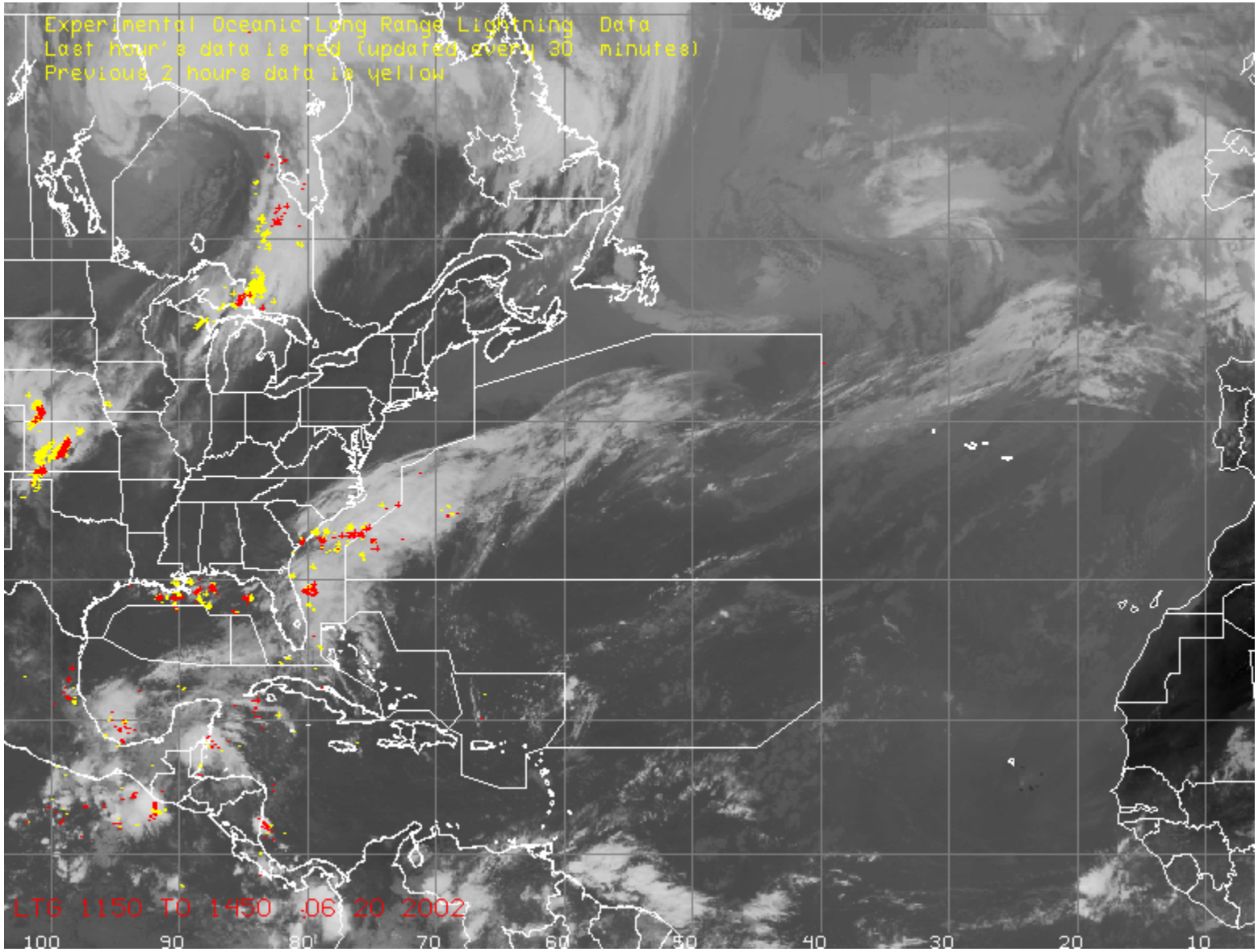

Figure 3 – Lightning Data Product Generated by the Aviation Weather Center Using Long Range Data