Alaska Lightning Detection Network (ALDN)
Briefing Document
June 26, 2012

Introduction

The Alaska Fire Service (AFS) owns and maintains the Alaska Lightning Detection Network (ALDN). Working with the scientific community from the University of Arizona, Tucson, a prototype system was installed in Galena and field tested in 1976. Many transitions have occurred in the last 35 years including: changes and improvements in technology, expansion of sensors within the network and the inclusion of data from Environment Canada (EC). Each transition has improved detection efficiency (more lightning reported), accuracy (strike location) and detection coverage across Alaska (able to detect at further distance).

Technology Evolution

The first operational ALDN was installed in 1980 – 1981. At that time three separate networks were established across the Fire Management Zones in Fairbanks, Galena and McGrath. These networks consisted of four Model 80-02 sensors and one Model 80-02 position analyzer. Data was collected and output was displayed on HP X-Y Plotters.

During the late 1980s and early 1990s the sensors were upgraded to the latest technology and a single Alaska network established with a Model 280 position analyzer located in Fairbanks. By 1993 the network consisted of sensors located in Bethel, McGrath, Unalakleet, Galena, Tanana, Bettles, Ft. Yukon, Fairbanks, and Tanacross. AFS was also including data from three Canadian sensors; Dawson, Mayo and Burwash, in the correlation of lightning. During the 1990s enhancements to software continued to improve the efficiency of detection and location accuracy.

Between 2000 and 2002 AFS upgraded all sensors to the current Impact ES sensors and installed the LP2000 position analyzer. These improvements also modified our relationship with Environment Canada (EC) and by 2002 the EC sensors located in Old Crow, Eagle Plains, Burwash, Dawson, Faro, Whitehorse and Sandspit were contributing to Alaska solutions. The last additions to the current ALDN were completed in 2007 with the addition of sensors in Port Alsworth and Cordova in Alaska and the inclusion of Dease Lake, Watson Lake and the Terrace sensors from Canada.

The current Vaisala technology installed in Alaska utilizes the thresholds of 0.5 seconds and a 10km radius between successive strokes to determine multiplicity (strokes per flash). The data collected with these thresholds along with a location-based algorithm with several spatial and temporal ranges are used to convert stroke data into flashes. The debate across the scientific community continues, however the opinions regarding the percentage of single stroke flashes can vary between 17% - 44%. A scientific explanation does not exist, however negative flashes are typically composed of 2.1 – 2.8 strokes and 1.1 – 1.4 for positive flashes. The AFS Vaisala implementation also discards any flashes detected outside of a 500 mile radius of the sensor.

In 2010, as part of the equipment replacement cycle, AFS purchased DSP-DF200 Multi-Purpose Advanced Lightning Sensors and the Advanced Stroke Processor from TOA. This technology change was based upon technical and cost analysis. Installation of the new sensors began in 2011 with project completion in 2012. The AFS technical staff along with the National Weather Service has completed comparison studies of both the Vaisala and TOA systems to validate sensitivity and accuracy (see attached maps). The TOA technology reports strokes verses the Vaisala reported flash with multiplicity. AFS plans to convert to the TOA technology for lightning displays on July 10, 2012.

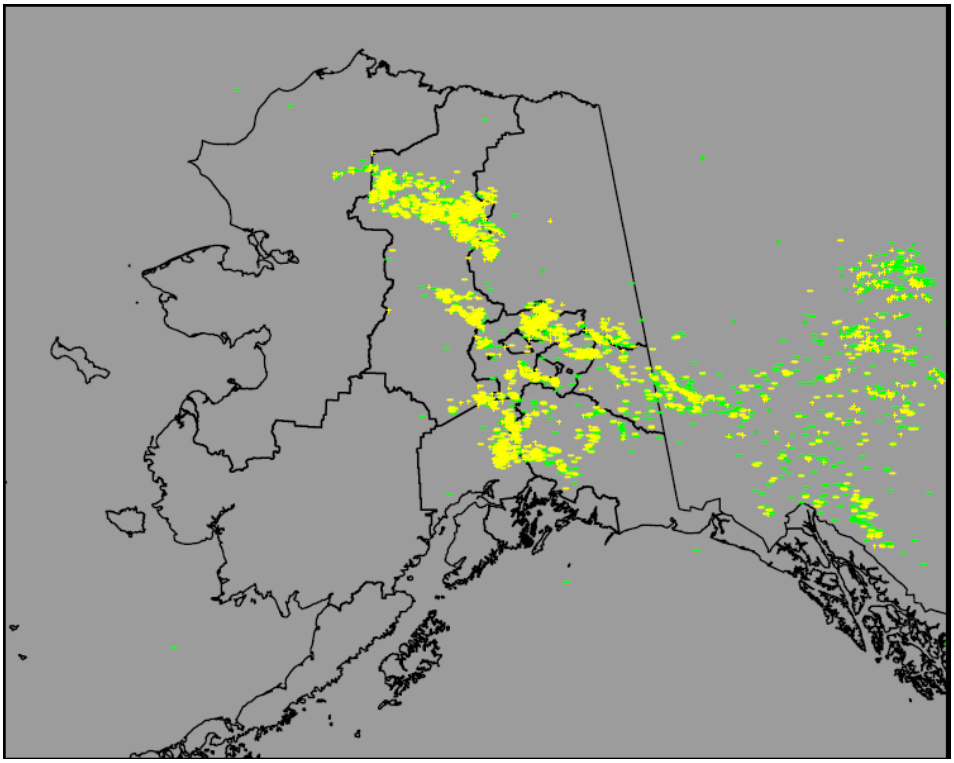
The new ALDN will consist of TOA sensors at Barrow, Kaktovik, Kotzebue, Ft. Yukon, Galena, Bethel, McGrath, Glennallen, Tok and Sitka. Data from TOA owned sensors located at North Pole, Wasilla, False Pass and Ross River (Canada) will also be used in the collection of stroke data. Future sites include: Bettles, Nome, Port Alsworth and Yakatat. We are also negotiating obtaining data from three privately owned TOA sensors in Canada.

Summary

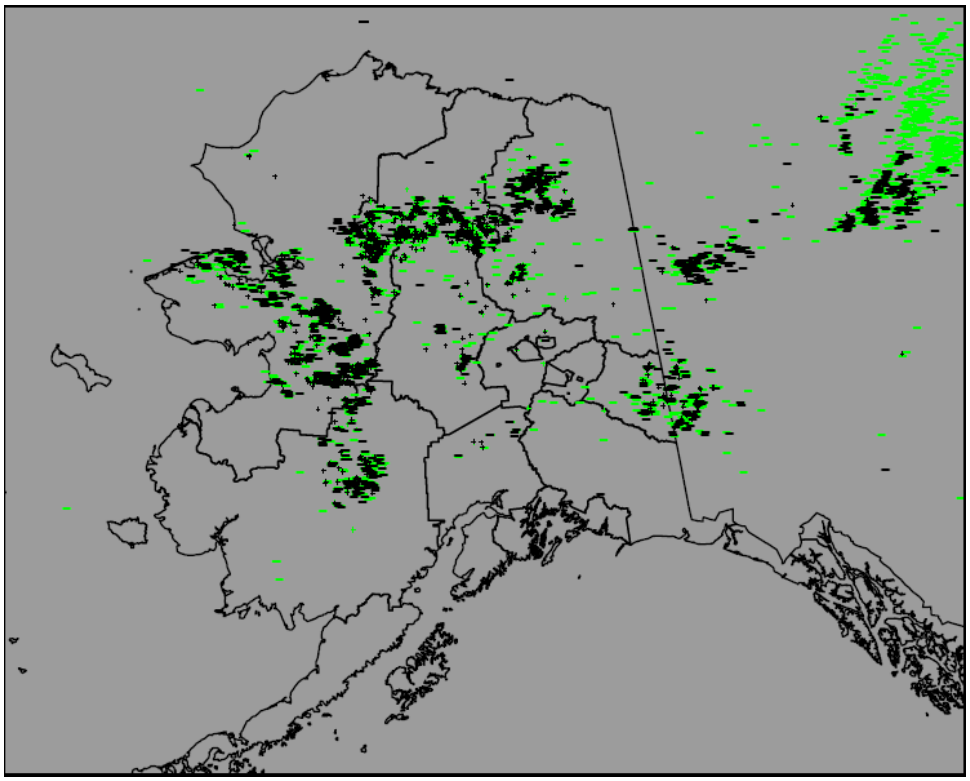
The AFS comparison studies indicate the TOA ALDN is reporting 2.25 times the lightning displayed by the Vaisala sensors. It is estimated that approximately 60% of that increase can be attributed to the difference in reporting strokes verses flashes. The balance of that increase results from detection efficiency, expanded statewide sensor coverage and longer range detection.

The AFS ALDN has continued to evolve over the last 35 years with significant improvements in hardware, software and number of sensors reporting. The technological improvement scheduled for implementation on July 10, 2012, is the next phase in that continued evolution.

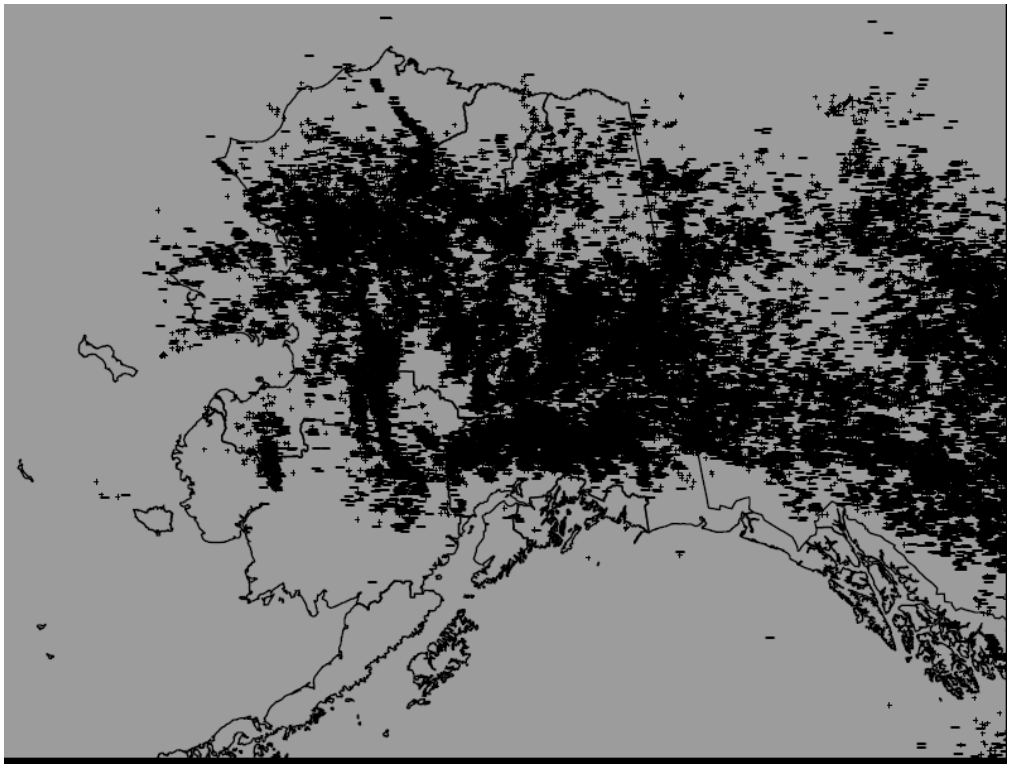
Please forward additional questions to Bev Fronterhouse, Branch Chief for Business and Technology Management, Alaska Fire Service at (907) 356-5591 or bfronter@blm.gov.



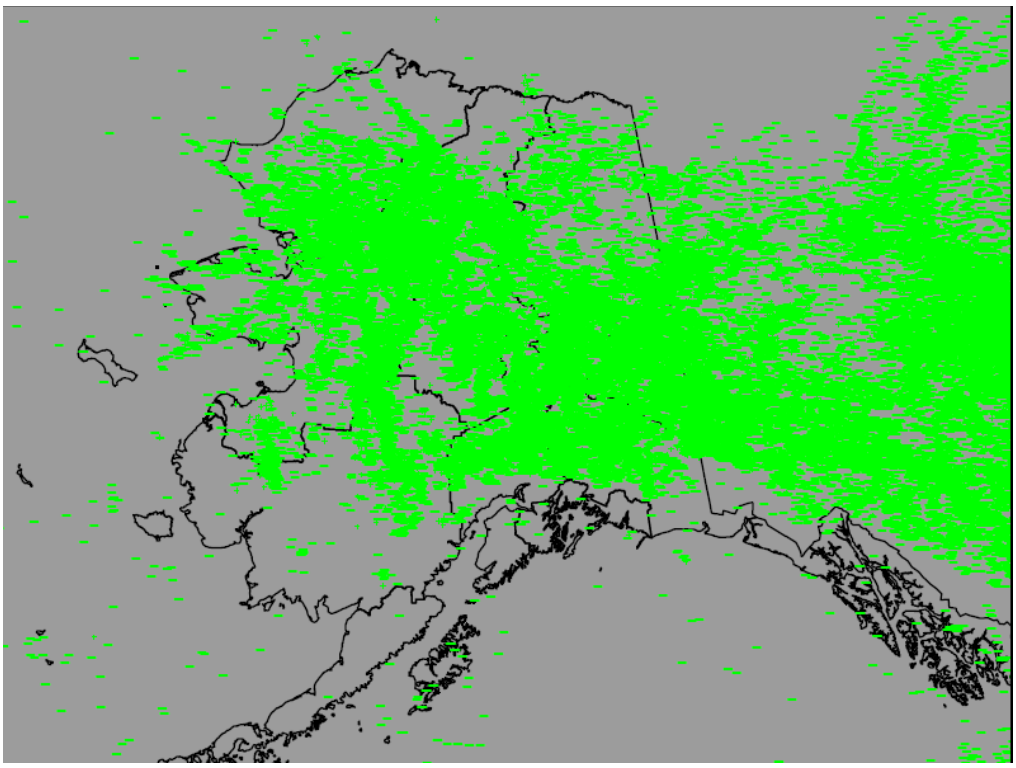
July 4, 2009
Vaisala = Yellow
TOA = Green



July 23, 2009
Vaisala = Black
TOA = Green



July 1 – August 13, 2009
Vaisala



July 1 – August 13, 2009
TOA