

## Satellite Observation of Forest Fire and Thundercloud in Alaska

Hiroshi Hayasaka<sup>1\*</sup>, Murad Ahmed Farukh<sup>1</sup>

<sup>1</sup>Graduate School of Hokkaido University

In 2004, wildfires burned 26,700km<sup>2</sup> in Alaska. Nine individual fires exceeded 1,000km<sup>2</sup> in size during a summer characterized by record high temperatures and extreme drought. A substantial portion of fire growth was realized on just a few days when strong pressure gradient winds occurred. Total burn area in 2004 was the largest since record-keeping began in Alaska in 1956. Combined with an additional 19,000km<sup>2</sup> burned in 2005, the area burned equals 10% of Alaskan boreal forest area in just two years. Such regional fire events are believed to be climate driven. To clear more about recent forest fire activity in Alaska, we are analyzing lightning data from Alaska Forest Service now. As many large forest fires in Alaska were ignited by lightning strikes, we started lightning data analysis. Weather data were also reanalyzed to find weather condition for thundercloud formation. Thundercloud formation and movement were also recognized using a satellite imagery captured by Terra and Aqua. Satellite imagery was also used to clear position of lightning strike and forest fire area. Forest fire area and fire growth were also analyzed by using daily MODIS hotspot. Because fire size in Alaska is sometime very large, for example, burnt area of Boundary Fire in 2004 was 2,180km<sup>2</sup>.

The results of our analysis were very useful in explaining not only thundercloud formation but also forest fire activity in Alaska. Main conclusions of this study are as follows:

1. Extraordinary occurrence of lightning flash of about 120,000 was detected in 2004, 2005 and 2007. This number is about three times larger than average number of lightning flashes in Alaska.
2. Under condition of large number of lightning flashes, about 300 forest fires were ignited in 2004, 2005 and 2007 respectively. Thus, apparent ignition rate was about 0.25% and this rate was smaller than average value of 0.44%.
3. The burnt area in 2004 was about 26,000 km<sup>2</sup> and largest in Alaskan half century history. This record was made with the help of drought condition.
4. The largest number of lightning flashes more than 120,000 occurred in 2005 but burnt area was about 18,800 km<sup>2</sup>, 30 % smaller than that of 2004. This may be mainly due to precipitation of about 80 mm in fire season.

Keywords: Forest Fire, Thundercloud, Hotspot, Ignition