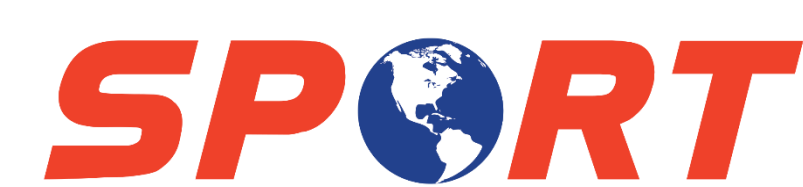
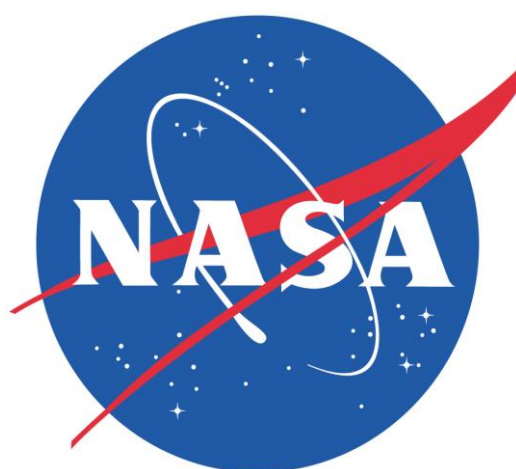


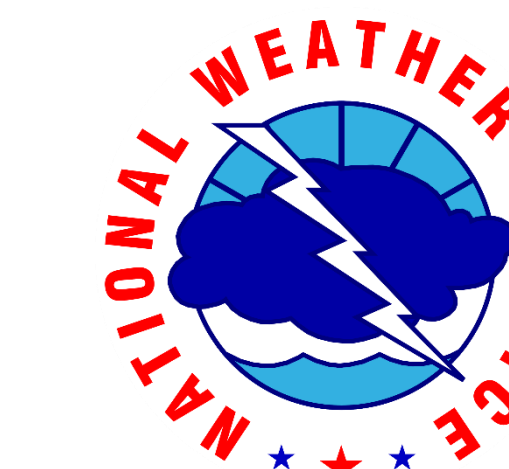
# Understanding Changes in Modeled Land Surface Characteristics Prior to Lightning-Initiated Holdover Fire Breakout



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Lightning initiated wildfires are only 16% of the total number of wildfires within the United States, but account for 56% of the acreage burned. One of the challenges with lightning-initiated wildfires is their ability to “holdover” which means smolder for up to 2+ weeks before breaking out into a full fledged fire. This work help characterize the percentage of holdover events due to lightning, and helps quantify changes in the land surface characteristics to help understand trends in soil moisture and vegetation stress that potentially contribute to the fire breaking out into a full wildfire.

**Datasets used:** USFS wildfire database (K. Short, 2017), NASA’s Operational Land Information System Model (SPoRT-LIS: Case 2016), National Lightning Detection Network data (Vaisala Inc., Buck et al. 2014).

**Methods:** Using the location, fire size, and date of the fire from the Short database, lightning data are interrogated to determine when the lightning flash occurred at the fire location. Next SPoRT-LIS output are interrogated to determine trends in land surface characteristics between flash occurrence and fire breakout.

## Lightning-initiated Wildfire Reporting and Identification of Holdover Events.

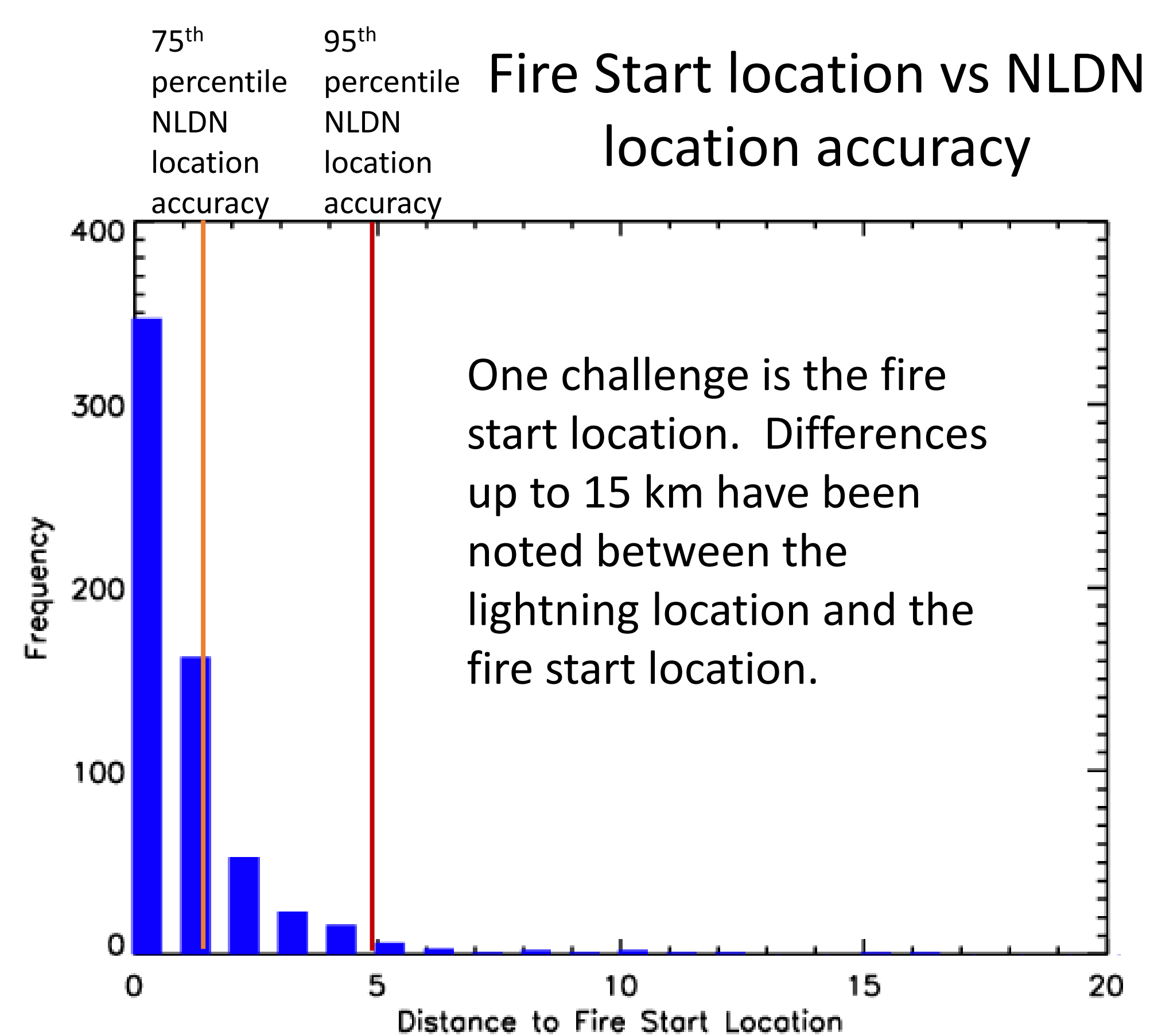
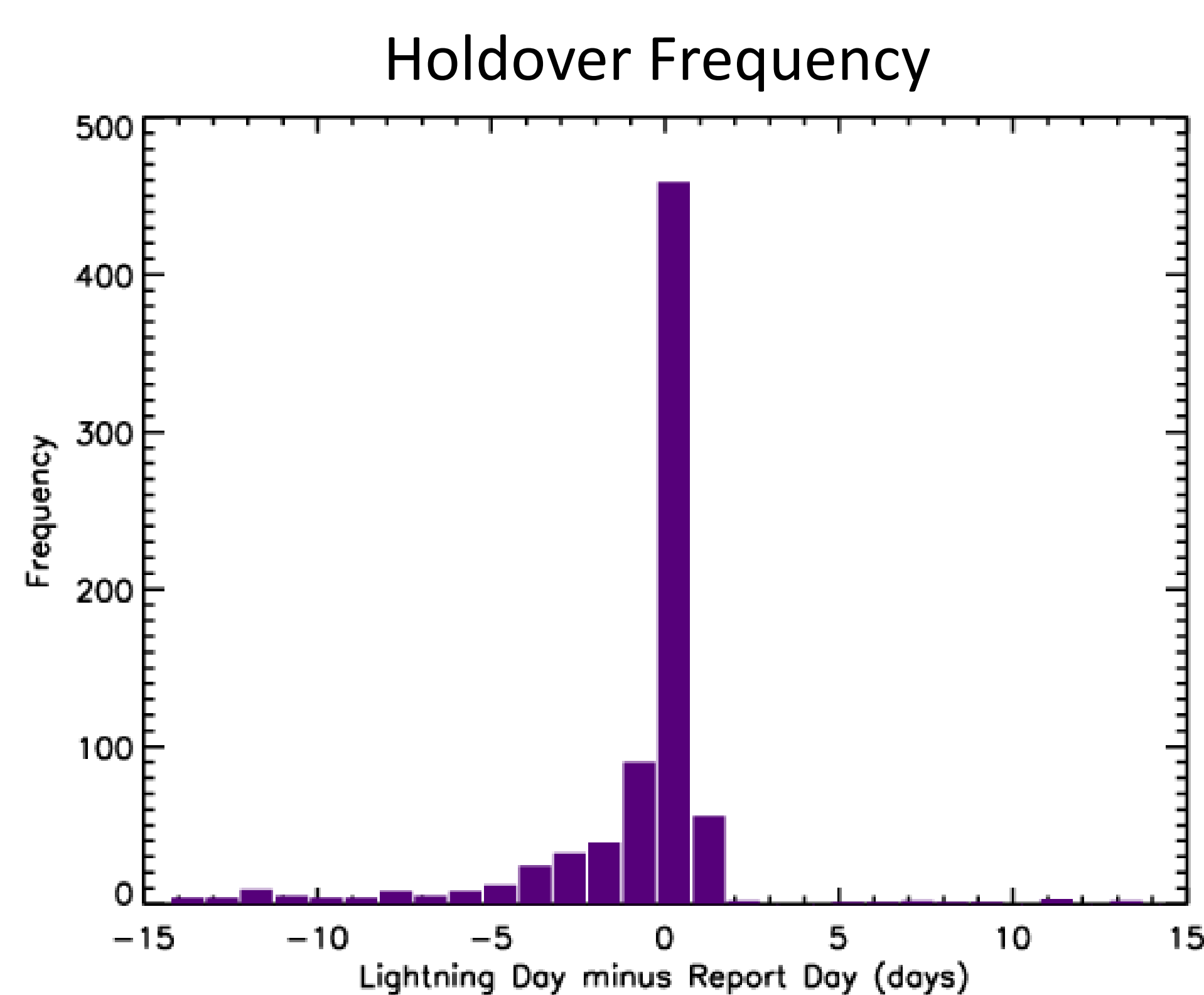
A total of 905 lightning-initiated wildfires were examined from 2012-2015 within the Continental United States.

81% of reported lightning initiated wildfires have lightning within the fire’s footprint within 14 days from the fire report date.

31% of the lightning associated with these fires occur outside of a 2 day window of the report date, or have no lightning at all in the 14 day time frame used in this study..

	IC+CG	CG Only
Percentage of Wildfires with lightning events within fire radius (within 14 days of fire report)	81%	75%

Days from Fire Report	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	Total
IC+CG	4	4	9	5	4	4	8	5	8	12	24	32	39	90	459	9	2	718
CG Only	3	2	8	5	4	4	6	4	2	8	22	29	33	84	439	9	2	664



One challenge is the fire start location. Differences up to 15 km have been noted between the lightning location and the fire start location.

## Lessons Learned

- Nearly 81% of reported lightning-initiated wildfires have a lightning flash within the bounds of the fire within 14 days of the fire report date.
- 75% of the fires that have a lightning flash associated with them occur within 2 days of the fire report date.
- The longest delay observed in these data was 13 days (Diego Fire).

**Diego Fire June 2014, NM**

Aqua MODIS 6/14/2014

Aqua MODIS 6/27/2014

Reported start date 6/25/2014  
Lightning date: 6/13/2014  
250 m from fire start location.

**Cases of Note**

**Washington Fire June 2015, CA**

Aqua MODIS 6/12/2014

Aqua MODIS 6/19/2014  
Red Dots are MODIS hot spot detections.

Reported start date 6/19/2015  
Lightning date: 6/11/2015  
2.35 km from fire start location.

NLDN data 6/13/2014

Blue asterisks are -CG flashes, Red Plus Signs are +CG flashes, Orange Triangle is the fire start location

NLDN data 6/11/2015

Radar of the parent precipitation feature that produces the lightning. Red dots are the location of the fire. Radar images are taken at the time of the fire-starting flash.

Diego\_NM 0-10 cm Relative Soil Moisture

90 day trend in 0-10 cm soil moisture in the SPoRT-LIS model at the location of the fire.

Radar of the parent precipitation feature that produces the lightning. Red dots are the location of the fire. Radar images are taken at the time of the fire-starting flash.

Washington\_CA 0-10 cm Relative Soil Moisture

90 day trend in 0-10 cm soil moisture in the SPoRT-LIS model at the location of the fire.

## Future Work

The authors are working to assess the relationship between precipitation, holdover events, and wetting of fuels. The authors are looking at the location of the lightning within the parent storm and the intensity of the storm at the time of the fire starting flash to understand which types of storms are producing wildfire events.

