

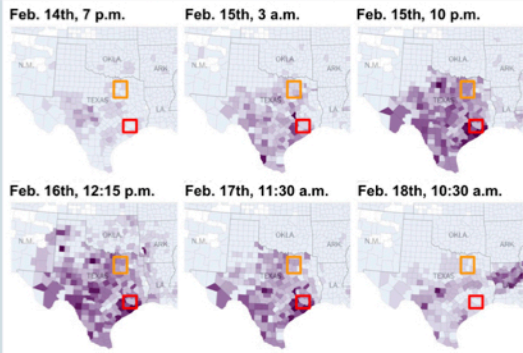
Extreme Event Analysis with VIIRS data

-- Power Outage Monitoring with VIIRS DNB during Winter Storm in Texas

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Motivation

The February 13-17, 2021 North American winter storm caused a wide range of power outage in Texas.



(Fig. 1: Popovich, Nadja, et al. "Mapping the Winter STORM'S Impact." The New York Times, The New York Times, 16 Feb. 2021, www.nytimes.com/interactive/2021/02/16/us/winter-storm-texas-power-outage-map.html.)
Two urban areas are studied for this event: Houston (Red Area) & Dallas -- Fort Worth -- Arlington (Orange Area).

Background

Visible Infrared Imaging Radiometer Suite (VIIRS) Day/Night Band (DNB) imaging is used in monitoring power outage during natural hazards.

- Night Band is used in this study for power outage monitoring;
- Night Band is taken around 1:30 A.M. local time every day;
- For DNB to be referenceable, it needs to be taken for a clear sky with almost no clouds.

Suomi-NPP and NOAA-20 are the satellites used in VIIRS, which are both used in the following study.

- Suomi-NPP plays critical part in collecting data on short-term weather conditions. The sounding instrument of Suomi-NPP could collect global environmental data.
 - NOAA-20 carries instruments that could observe Earth's climate in order to improve day-to-day weather forecasting.
- Based on the objectives of each satellites, most of the data used in this study is from NOAA-20. The usage of Suomi-NPP's data is used as an alternative.

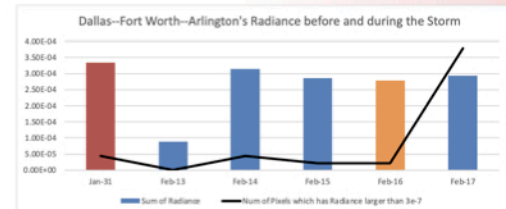
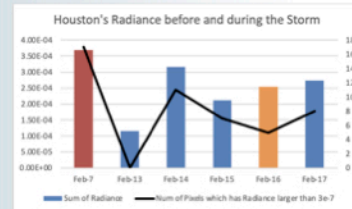
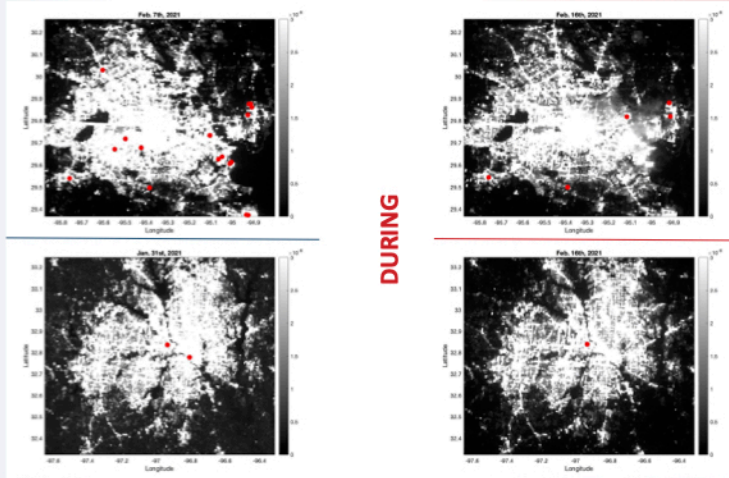
Data Processing

Houston

Dallas
--Fort Worth
--Arlington

BEFORE

DURING



Observation:

All of the sum of radiance during the storm are lower than that of the day before the storm.
February 13th's radiance is the lowest of all in both areas.

Houston

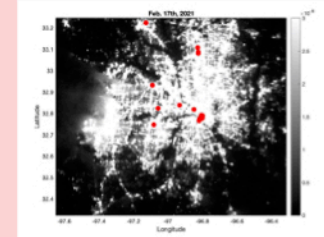
- Feb.13-17th (during the storm) has both sum of radiance and number of significant pixels lower than Feb. 7th (before the storm).
- The period of storm can be easily noticed from the histogram

Dallas--Fort Worth--Arlington

- Feb. 13-17th has lower sum of radiance than Feb. 7th's.
- Except Feb. 17th, Feb. 13-16th has lower number of significant pixels than Jan.31st.
- The period of storm may not be as easily noticed as Houston's histogram.

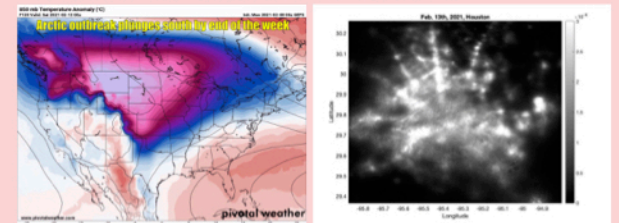
Analysis

Q1: Why Feb. 17th has more number of significant pixels?



A1: The additional red spots are either medical centers or storm shelters.

Q2: Why Feb. 13th has the lowest radiance of all?



(LEFT Fig. 2: Reiner, David. "A Tale of Two Seasons This Week; ARCTIC Outbreak Finally Arrives This Weekend." Texas Storm Chasers, 8 Feb. 2021, texasstormchasers.com/2021/02/08/a-tale-of-two-seasons-this-week-arctic-outbreak-finally-arrives-this-weekend/.)

A2: Based on the weather record, the storm hasn't affect either of the areas. In that case, we can deduce that the low radiance is because of the low cloud over the area. Take Houston as an example, the cloud can be clearly viewed from the right plot made from the NOAA-20 data. Similarly, the same conclusion can be made for Dallas--Fort Worth--Arlington area.

Acknowledgement

I would like to show my sincere appreciation to my supervisors, Dr. A Surjalal Sharma, Dr. X. Shao, and Dr. X. Jing.

I wish to extend my special thanks to CISESS of University of Maryland for the opportunity to work with the experts in the field.