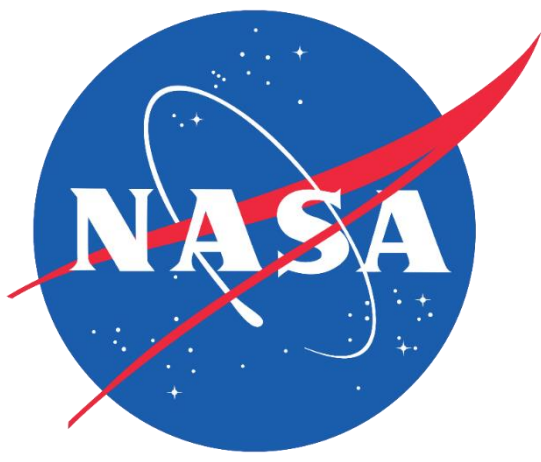




# Utilizing NASA and NOAA Earth Observations to Determine Lightning-ignited Wildfire Risks in Central Chile



## Abstract

In recent years, Central Chile has experienced wildfires of increasing frequency and intensity which threaten natural resources and communities. The Corporación Nacional Forestal (CONAF) is charged with planning for, detecting, and responding to wildfires caused by a variety of ignitions. Lightning is one ignition source for wildfires, but the rate of lightning-induced wildfire ignitions is unknown. In collaboration with CONAF and the Embassy of Chile, Agricultural Office, the team used Earth observations to visually assess potential relationships between lightning strikes and wildfire ignitions and then created a wildfire risk map for Central Chile. The Active Fire Product of Suomi NPP Visible Infrared Imaging Radiometer Suite (VIIRS) provided footprints of fires, which the team compared to lightning events detected by GOES-16's Geostationary Lightning Mapper (GLM) to determine the relationship between lightning strikes and wildfire ignitions. Next, the team aggregated and mapped lightning strikes from February 2018 through December 2021 across Central Chile. Finally, the team calculated and mapped a relative estimate of lightning-ignited wildfire vulnerability by aggregating the following ranked factors: lightning frequency, land surface temperature, and vegetation moisture content. The team was unable to establish a relationship between lightning strikes and wildfires hitherto, due to a confounding effect from fires started by other sources. However, the team successfully created wildfire risk maps for central Chile.

## Study Area

- ▶ Mediterranean climate
- ▶ Becoming drier and hotter due to climate change
- ▶ Increasing wildfire frequency and severity



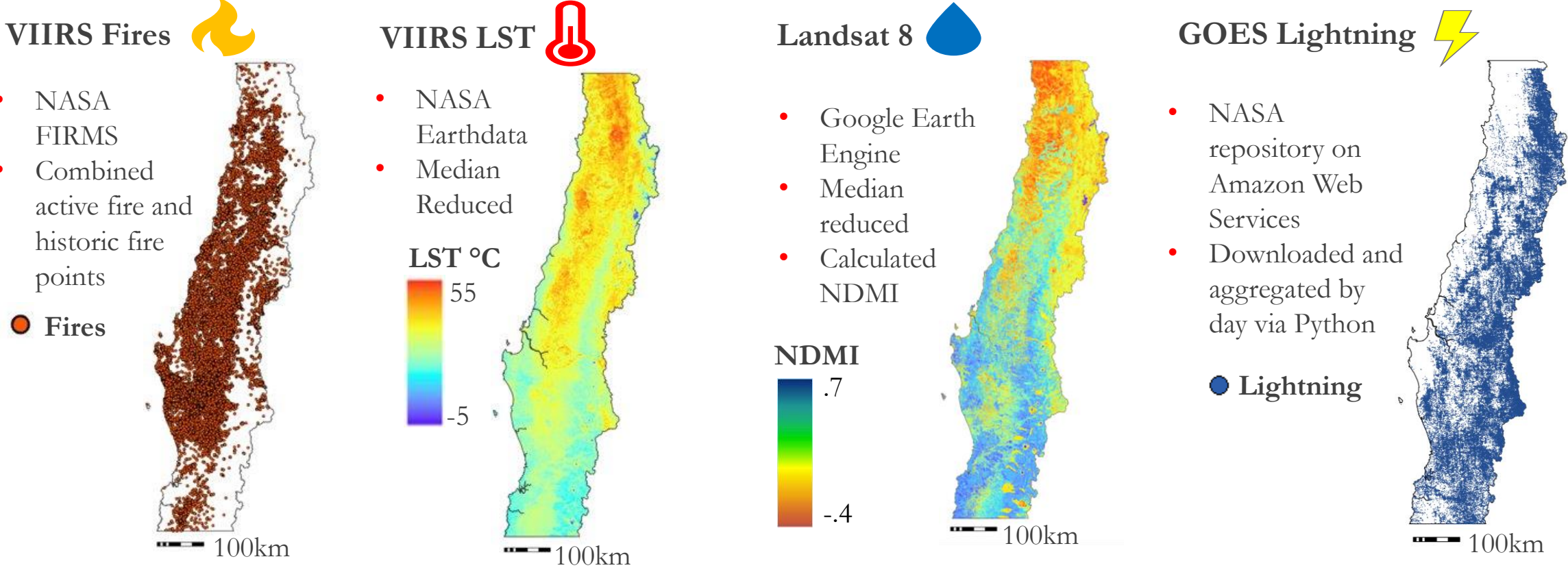
## Study Period

March 01, 2018 - February 28, 2022



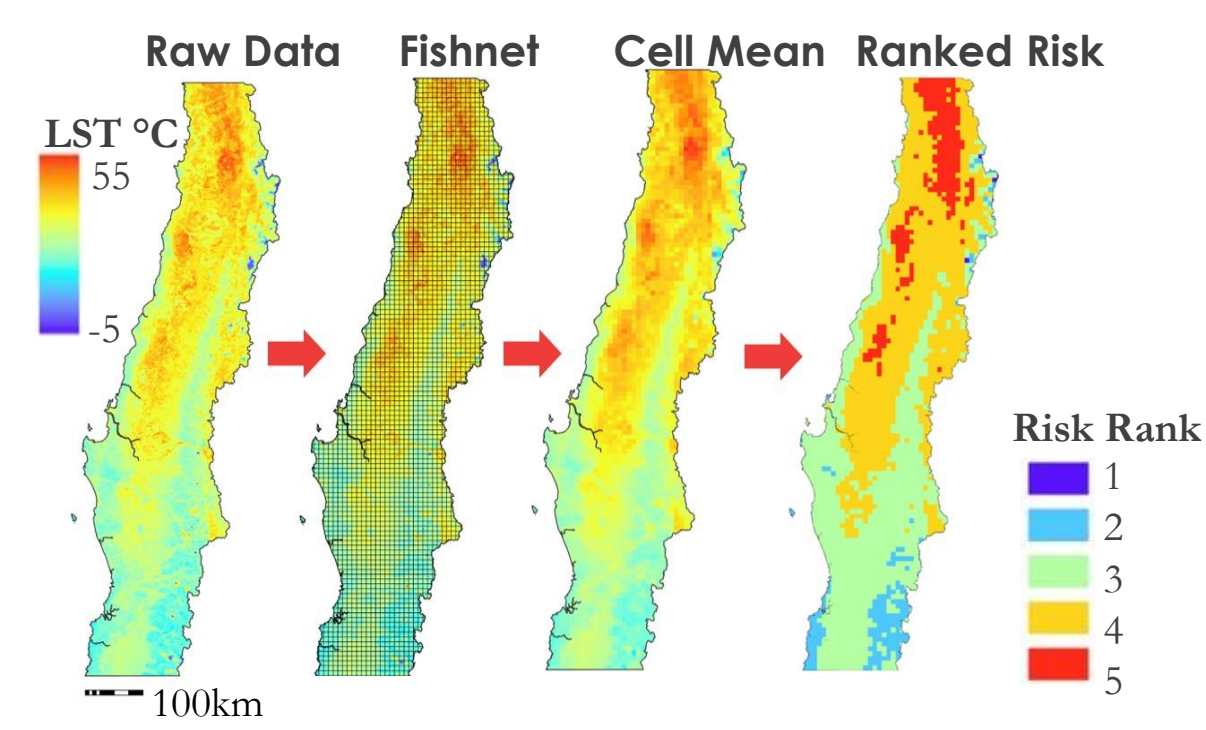
## Methodology

### 1. Acquire and Process Data



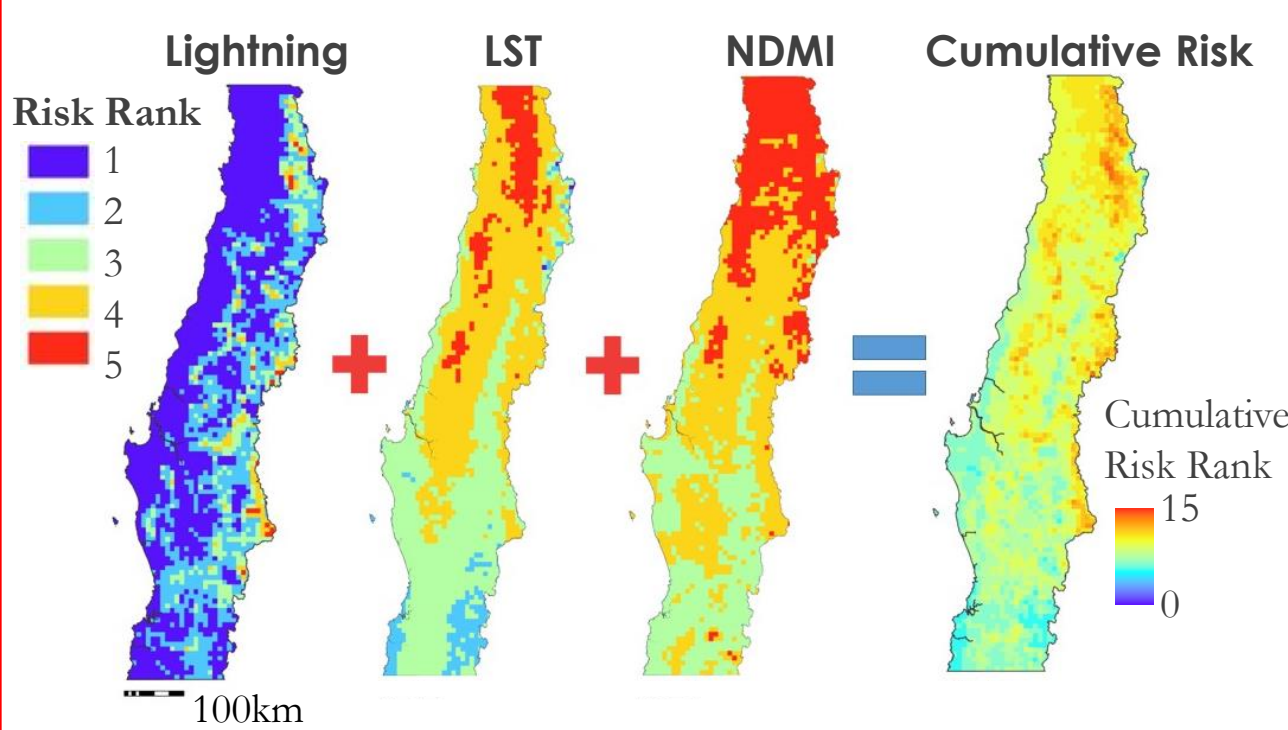
### 2. Calculate Ranks of Individual Risk Factors:

An LST Example



### 3. Calculate Cumulative Risk as Summation of Risk Factors:

A Fire Season Example



## Team Members



Chris Matechik  
(Project Lead)



Reuben Alter



Jennifer Ruiz



Stephen Sene

## Objectives

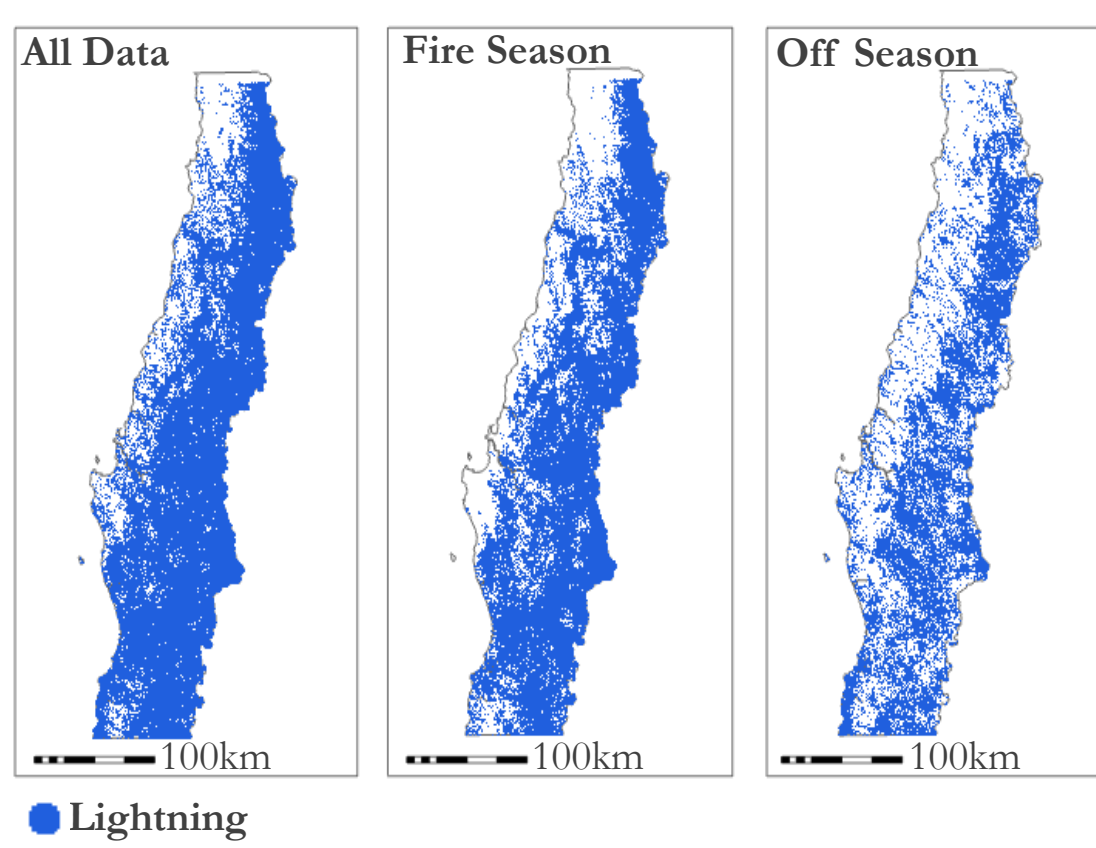
- ▶ **Map** lightning strikes and wildfires across central Chile to visually determine if they are related
- ▶ **Calculate and map** lightning frequency, LST, and NDMI as ranked risk factors for lightning-ignited wildfires
- ▶ **Calculate and map** the cumulative relative risk of lightning-ignited wildfires as the summation of lightning frequency, LST, and NDMI, risk ranks

## Earth Observations

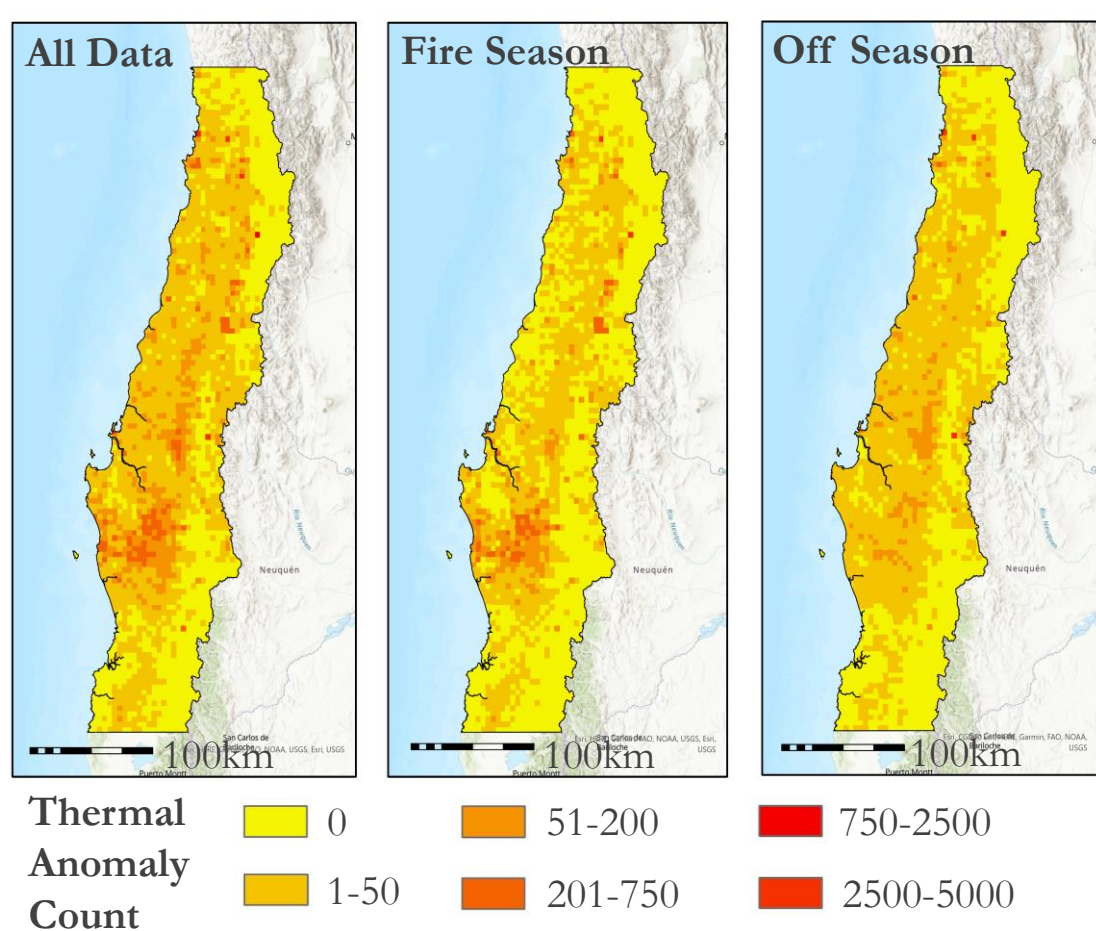
	Suomi NPP VIIRS	Active Fire Product (AFP)
	Suomi NPP VIIRS	Land Surface Temperature and Emissivity (LST)
	Landsat 8 OLI	Normalized Difference Moisture Index (NDMI)
	GOES-16	Geostationary Lightning Mapper (GLM)

## Results

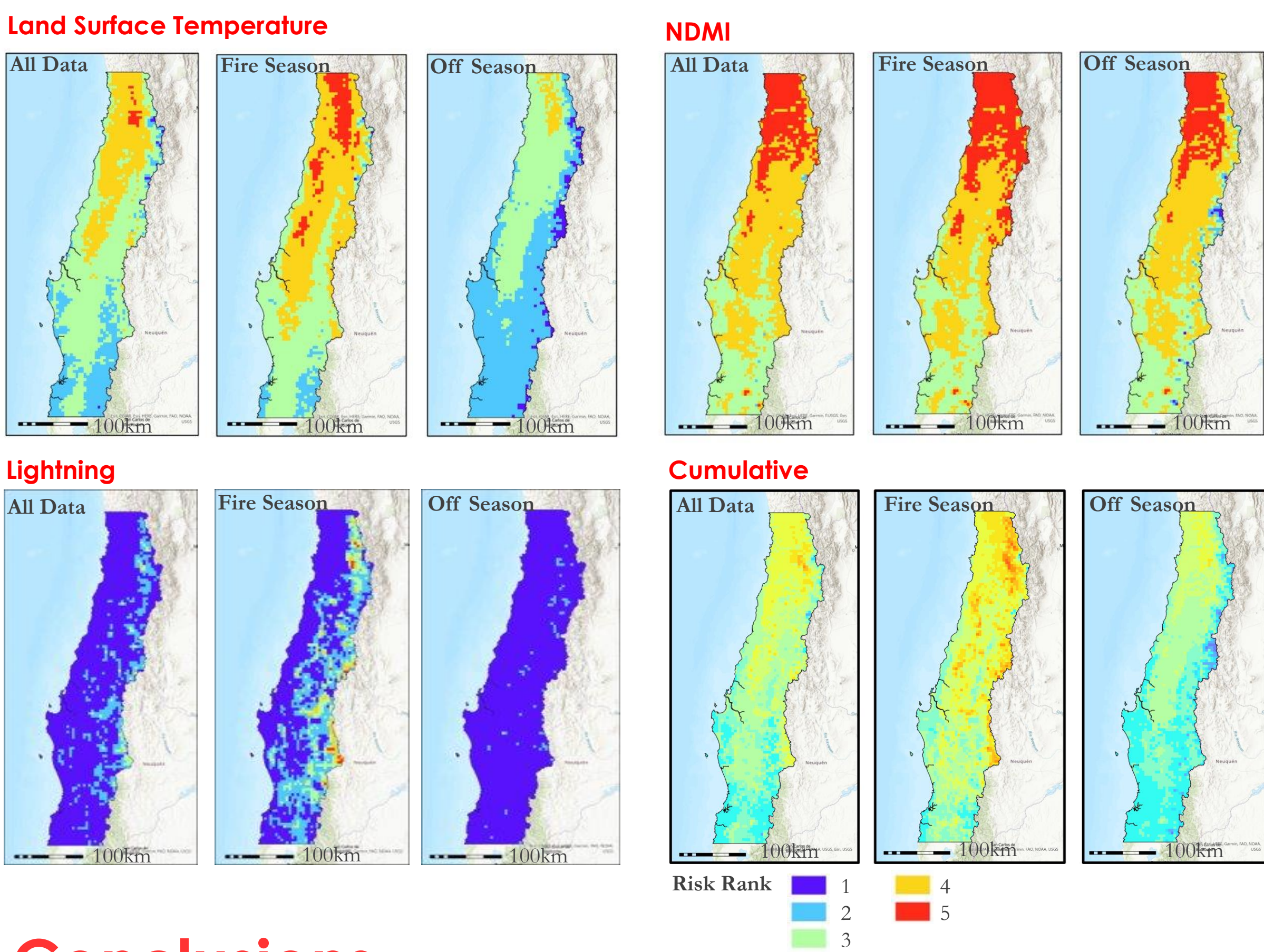
### Lightning Frequencies



### Wildfire Frequencies



### Risk Ranks



## Conclusions

- ▶ Lightning strikes are most numerous during the fire season.
- ▶ No spatial relationship between lightning and wildfires was detected hitherto but including spatial and temporal buffers around lightning strikes may improve the ability to detect a relationship.
- ▶ LST and NDMI risk patterns are similar, with greater risk in the northern third of the study area during fire season.

## Project Partners

- ▶ Corporación Nacional Forestal (CONAF)
- ▶ Embassy of Chile, Agricultural Office

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- ▶ Kristopher Bedka (NASA Langley Research Center)

Chile Wildfires