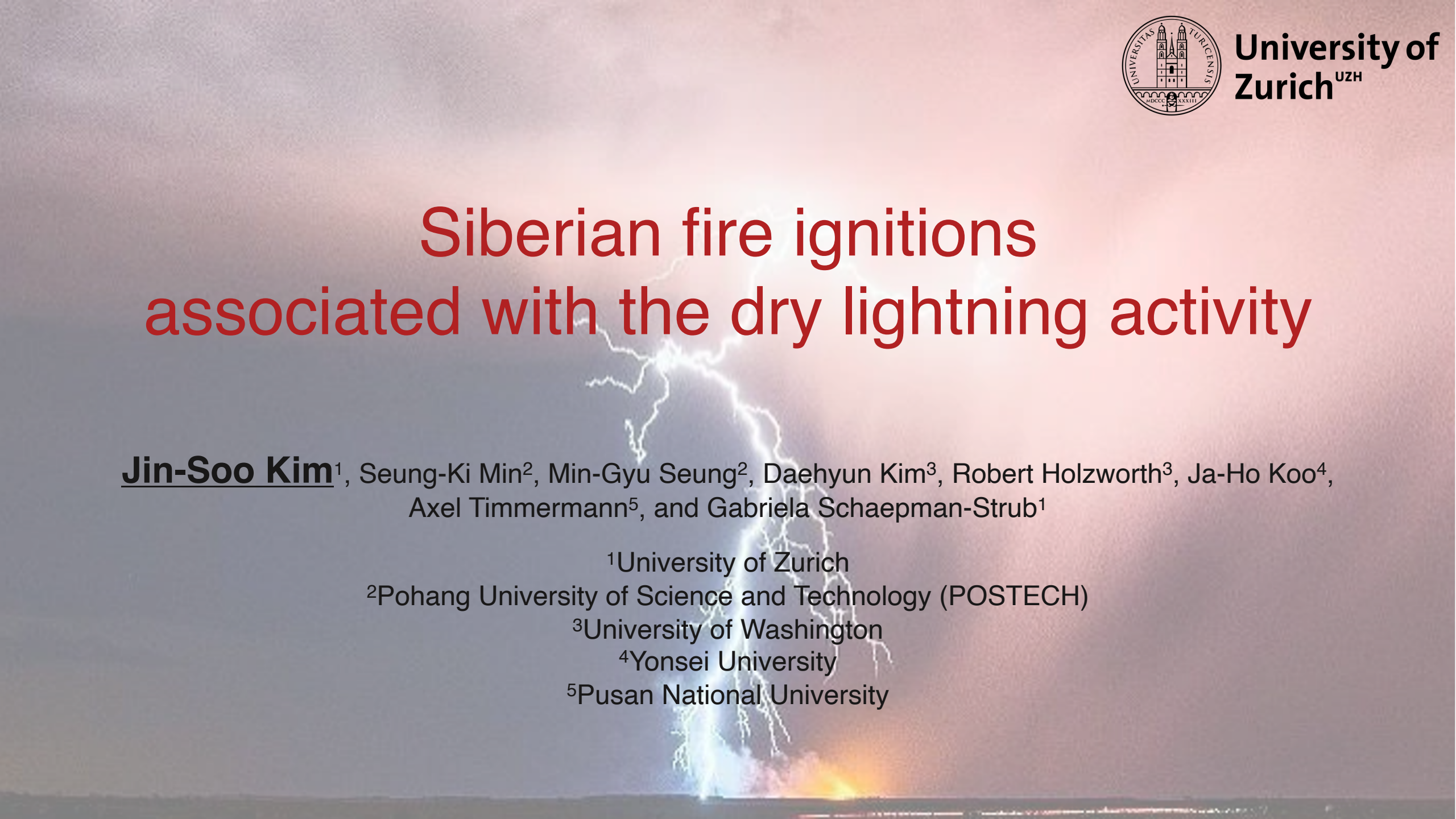


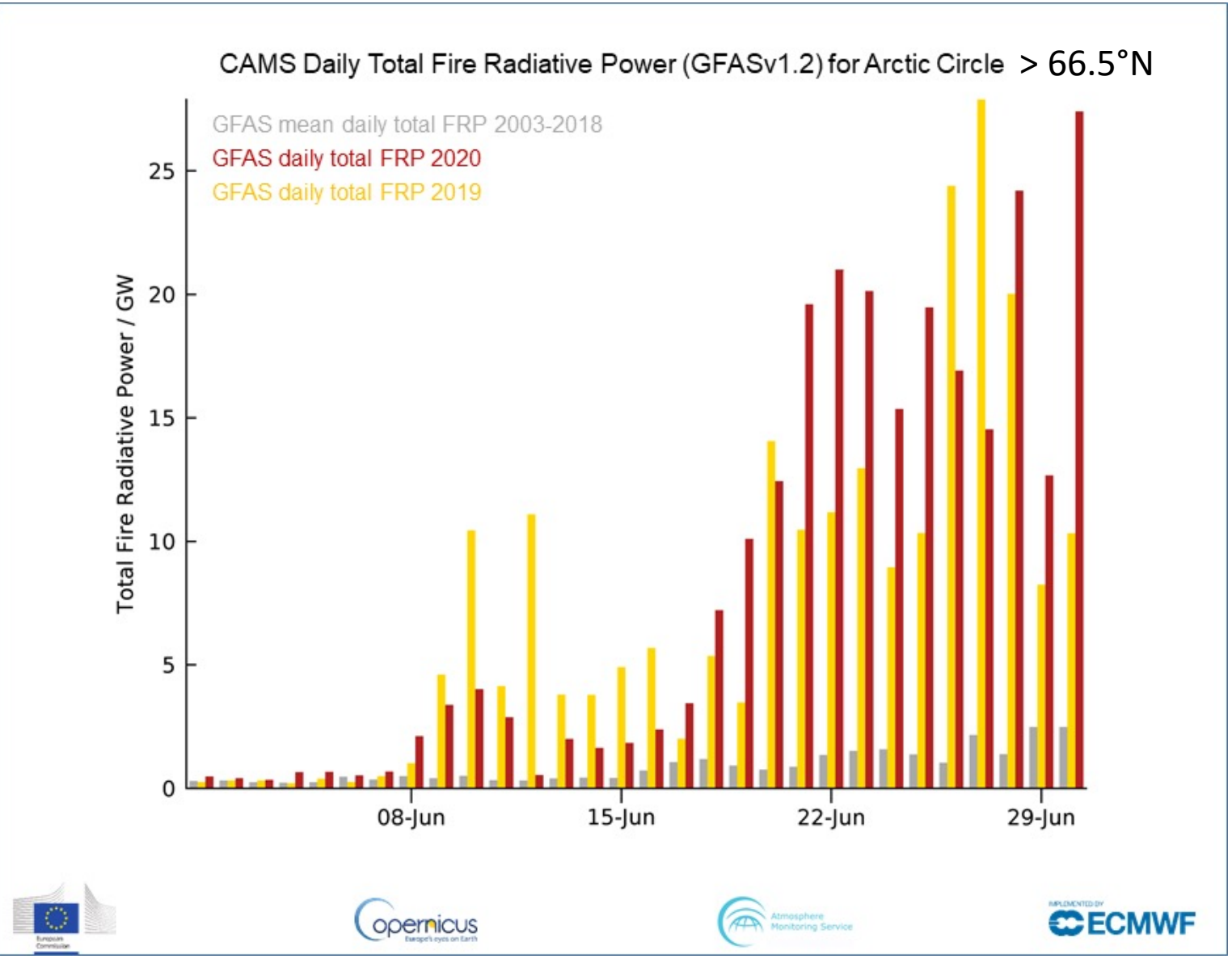
University of Zurich[UZH]

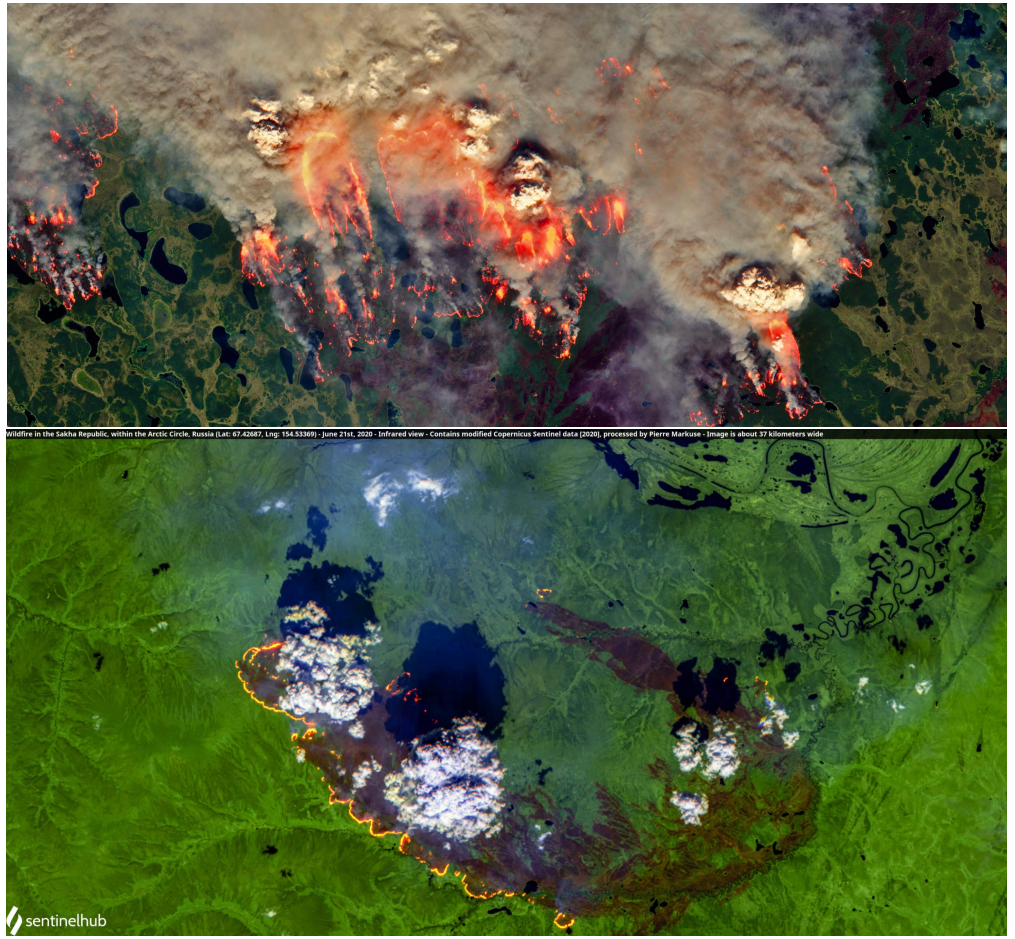
Siberian fire ignitions associated with the dry lightning activity

Jin-Soo Kim[1], Seung-Ki Min[2], Min-Gyu Seung[2], Daehyun Kim[3], Robert Holzworth[3], Ja-Ho Koo[4], Axel Timmermann[5], and Gabriela Schaepman-Strub[1]

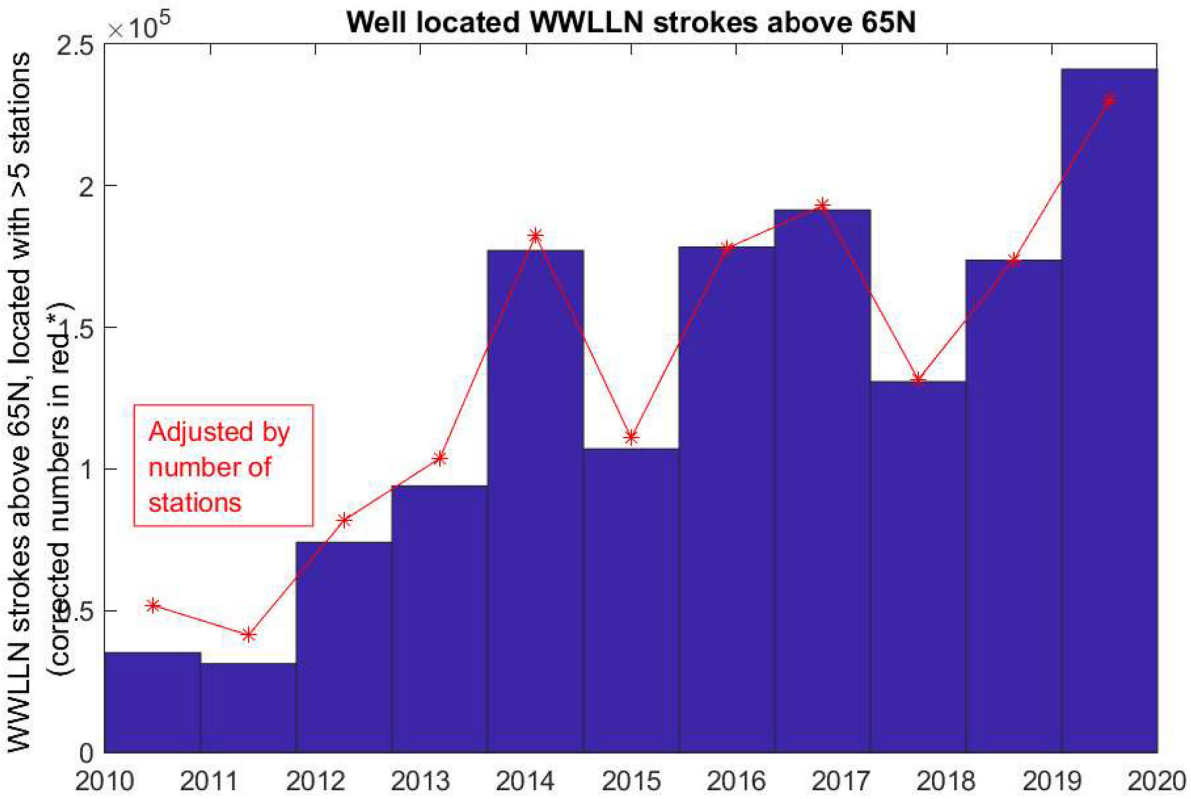
[1]University of Zurich
[2]Pohang University of Science and Technology (POSTECH)
[3]University of Washington
[4]Yonsei University
[5]Pusan National University

2019 – record-breaing, 2020 – record-breaking again

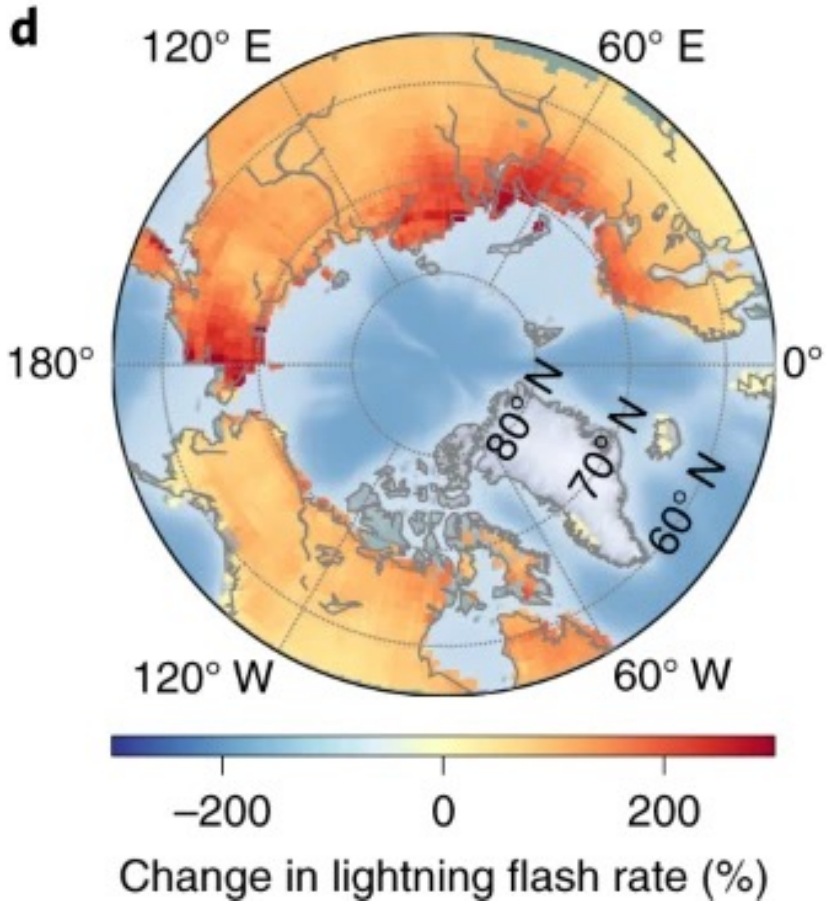




Lightning in the Arctic recently getting frequent and more frequent in the future



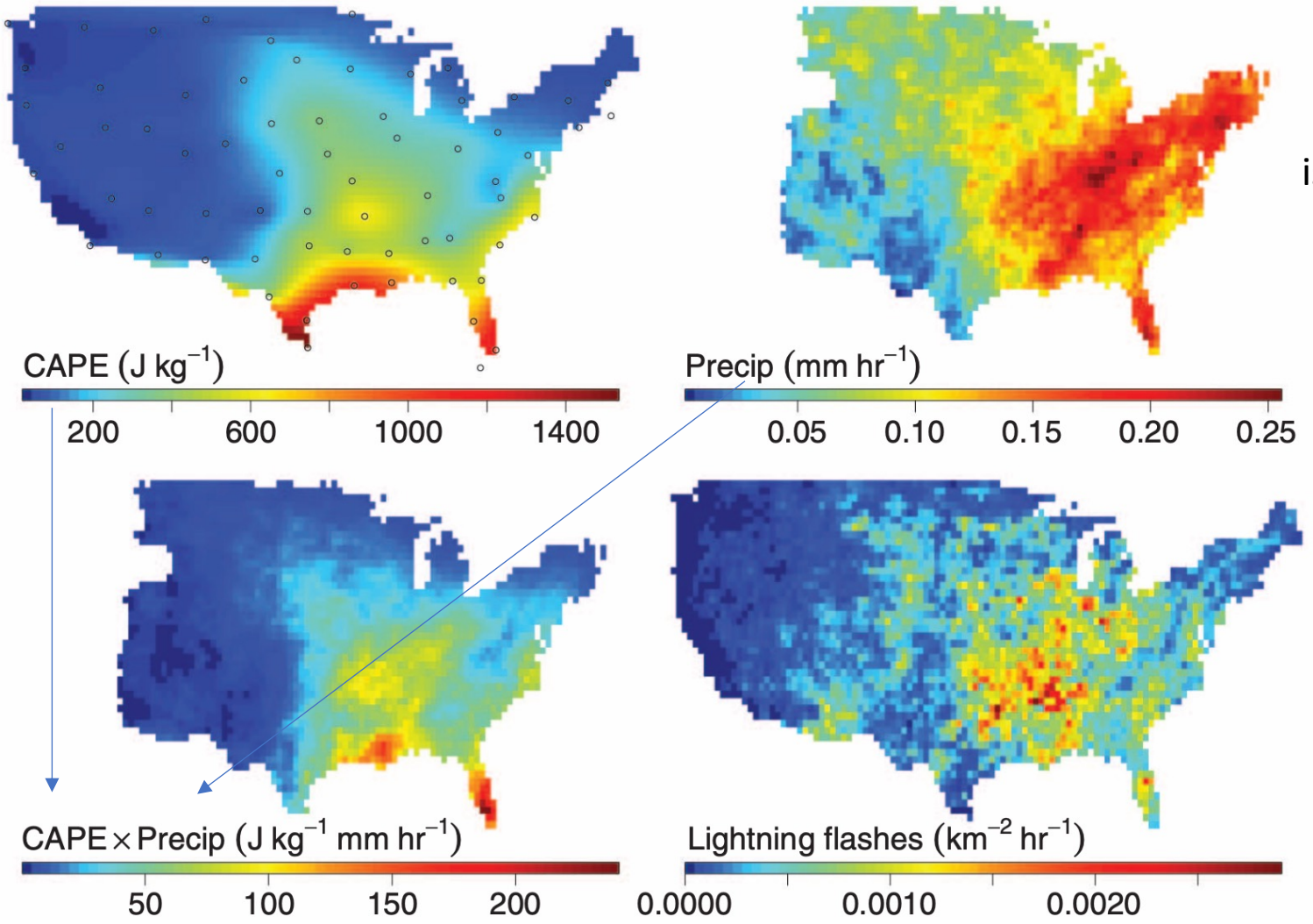
📖 *Holzworth et al. 2021 GRL*



📖 *Chen et al. 2021 NCC*

Lightning ~ Atmospheric instability x Precipitation

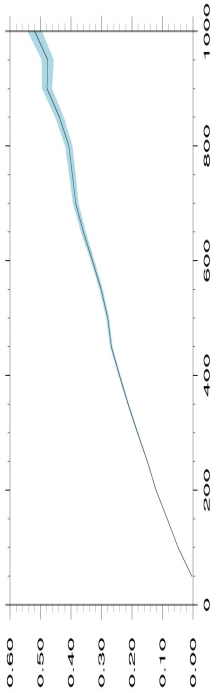
Amospheric instability



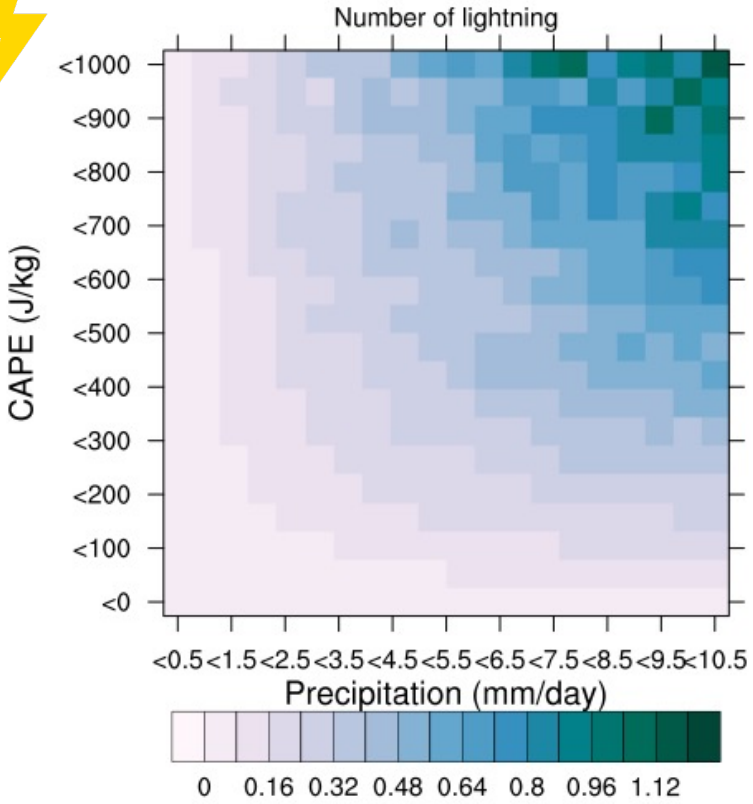
heavy rainfall
is accompanied by lightning

📖 *Romps et al. 2014 Science*

Lightning ~ Atmospheric instability x Precipitation in Siberia

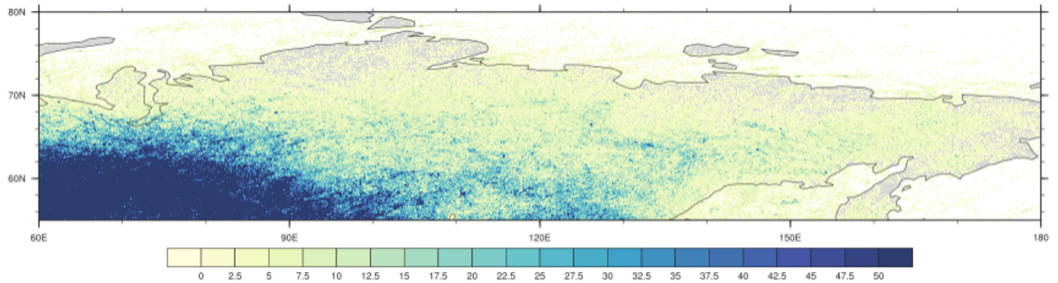


Lightning



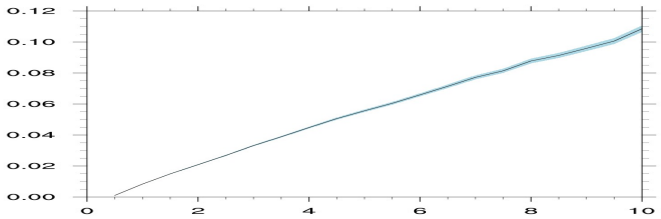
CAPE (ERA5, 0.25°→0.1°)
Precipitation (3IMERG, 0.1°)

Number of lightning (2012-2020, JJA)



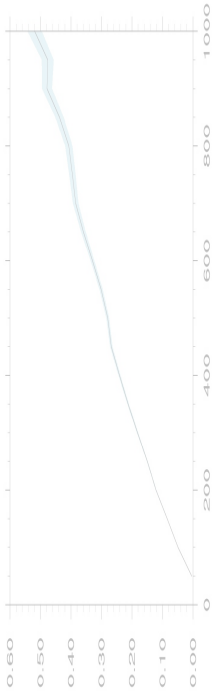
Study area: Siberia (60-180°E, 55-80°N)

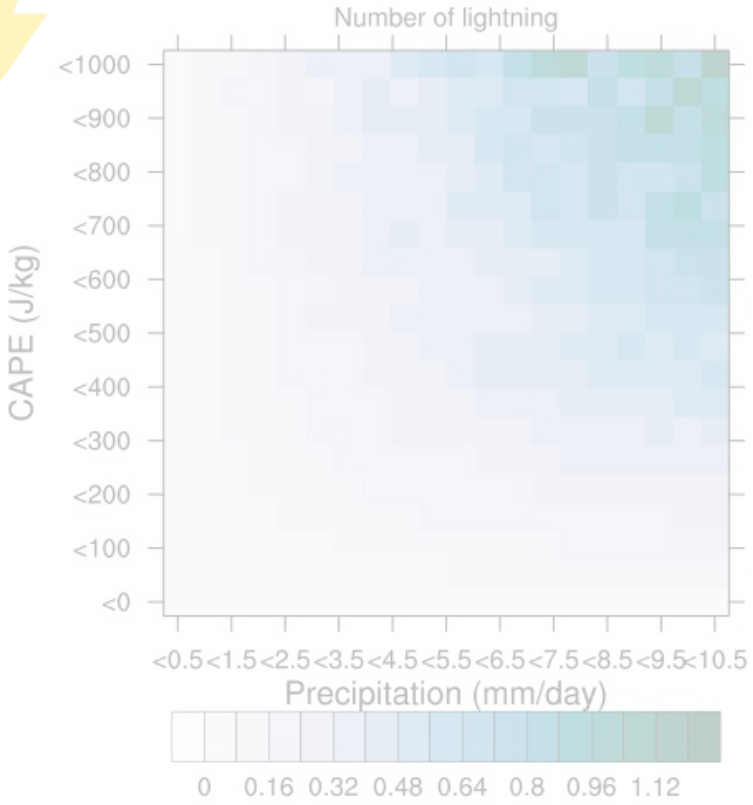
Lightning

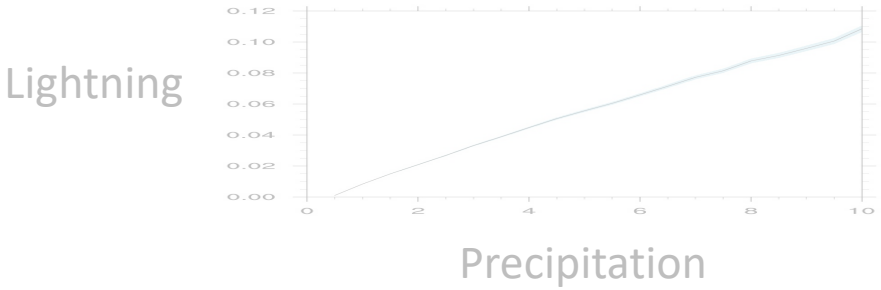


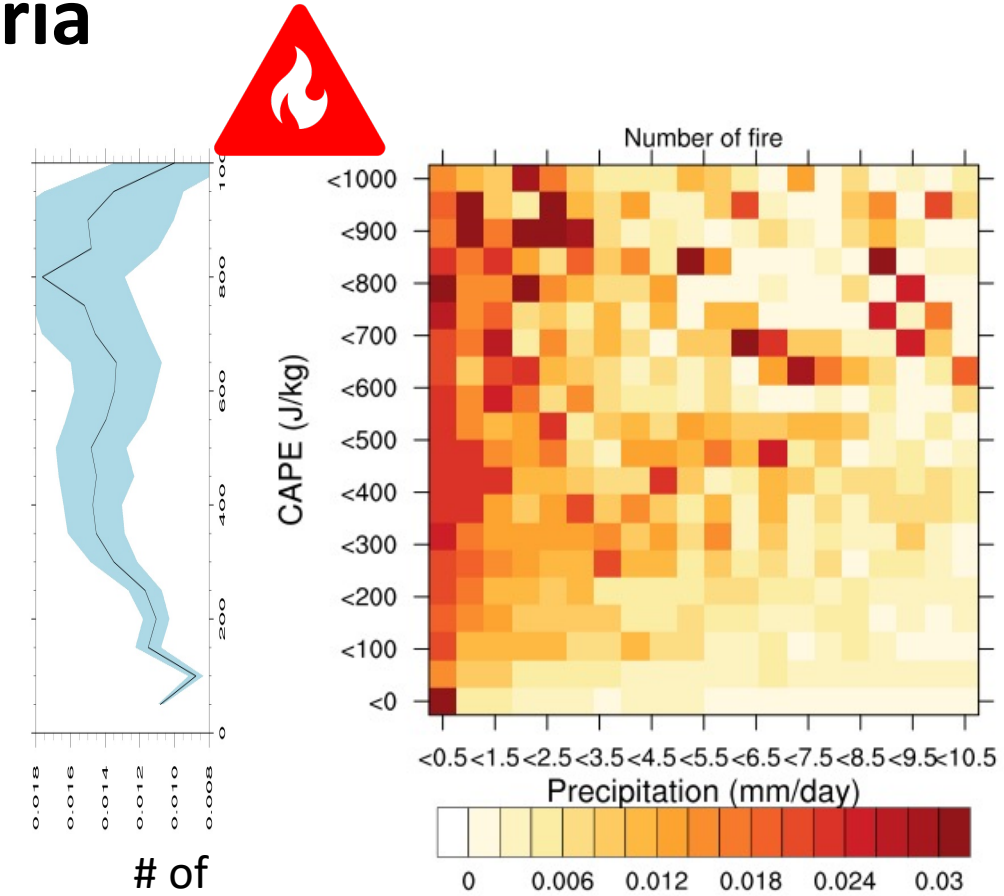
Precipitation

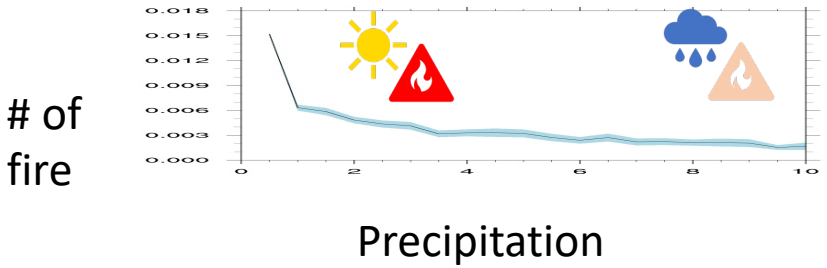
Number of fire ≠ Atmospheric instability x Precipitation in Siberia



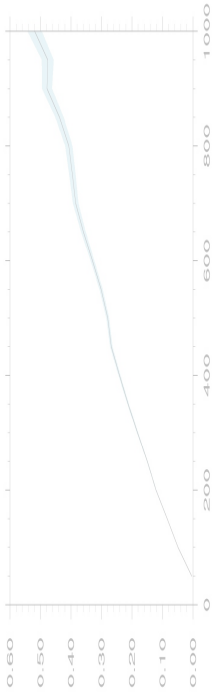


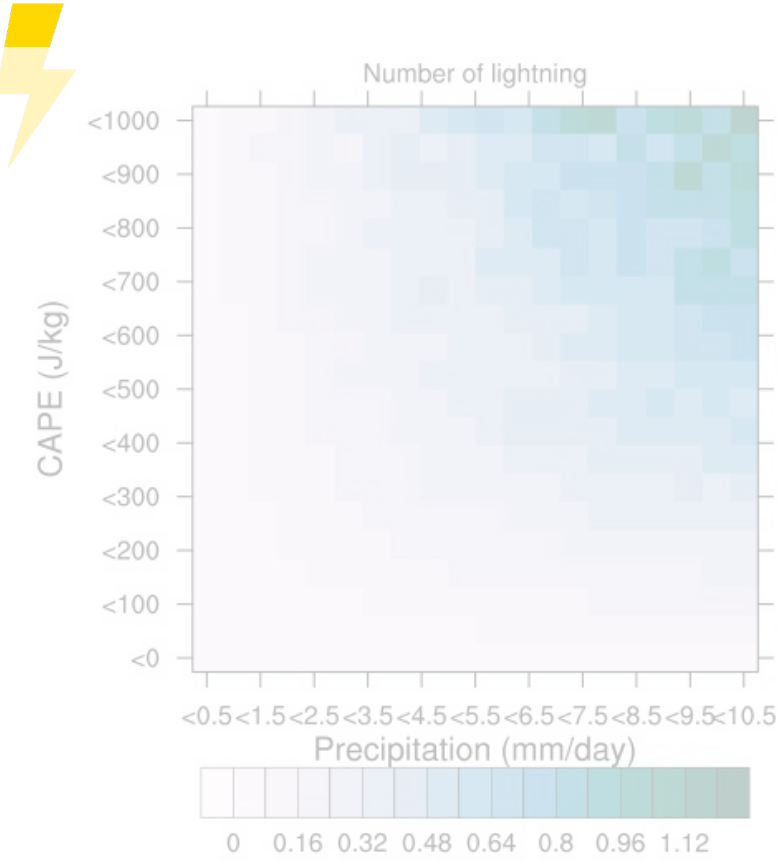


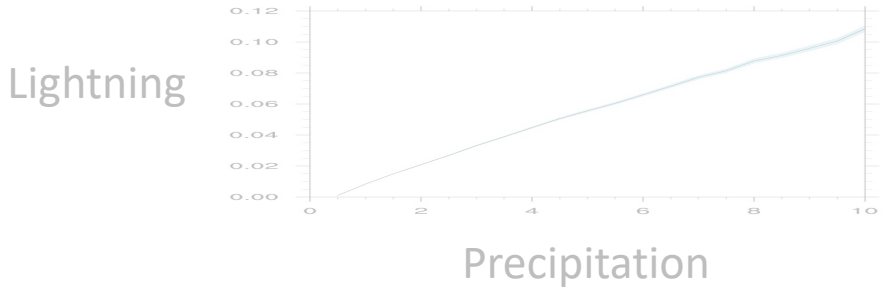


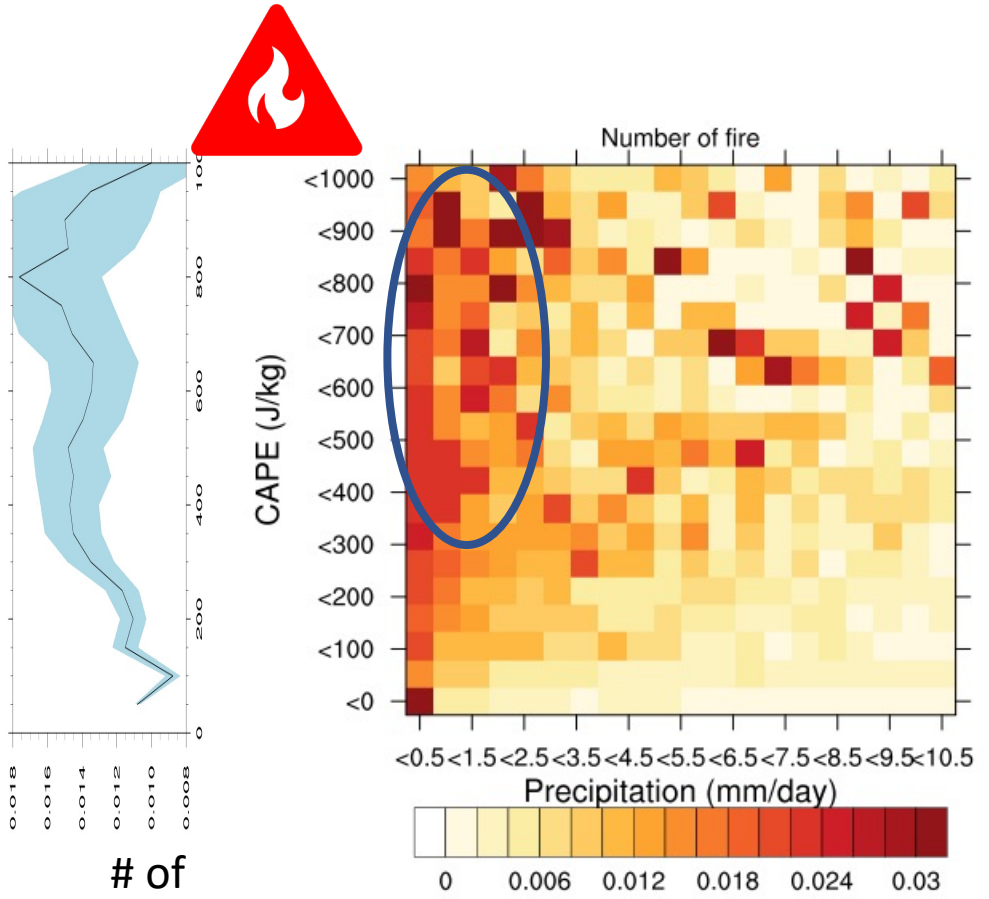


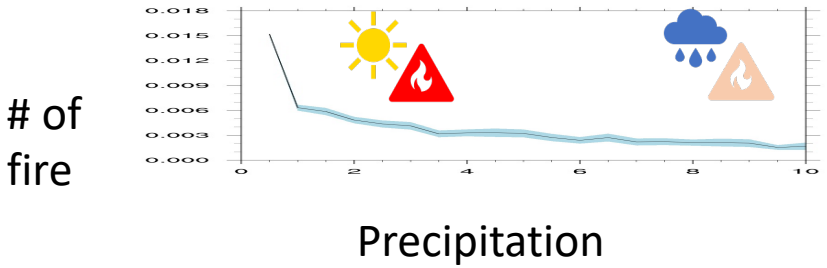
Dry lightning effectively causes Siberian fires











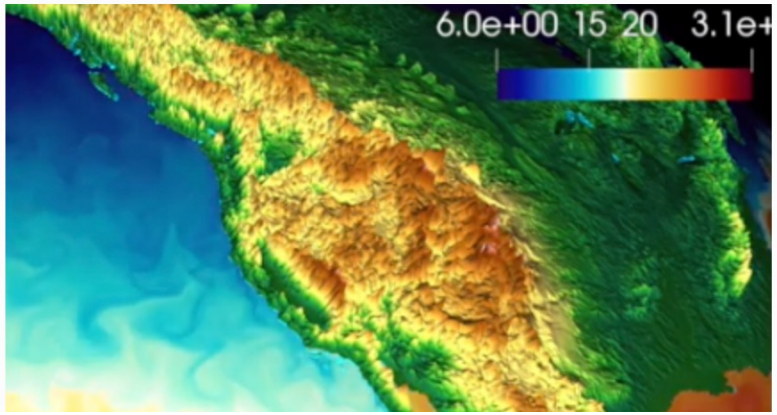
Ultra-high-resolution CESM1.2.2

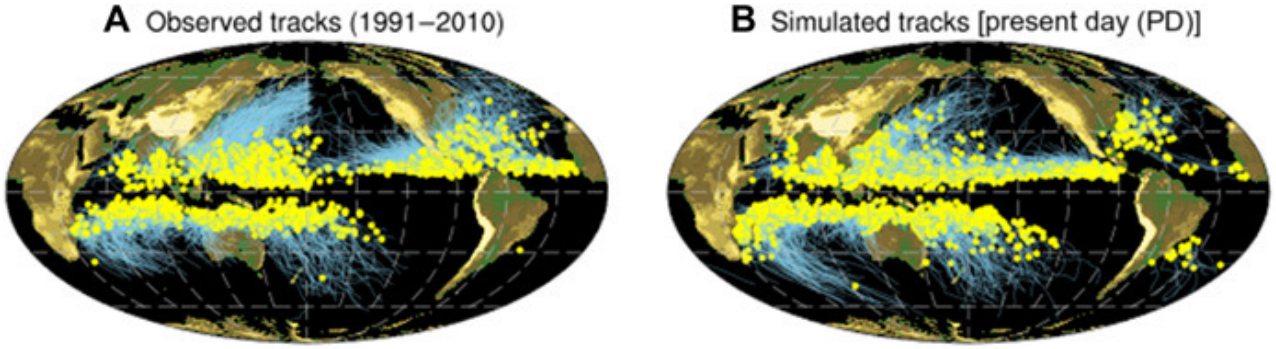
https://ibsclimate.org/research/ultra-high-resolution-climate-simulation-project/

Ultra-high-resolution climate simulation project

The ICCP has conducted ultra-high-resolution simulations with the goal of improving our understanding of scale-interactions and key mechanisms leading to climate variability and extreme weather events as well as exploring the sensitivity of the climate system to greenhouse warming.

The Community Earth System Model version 1.2.2 (CESM1.2.2) is employed to perform fully coupled (atmosphere, ocean, land, sea ice, river-runoff) global climate simulations. The atmospheric component is configured with about 25 km horizontal resolution and 30 vertical layers. The horizontal and vertical resolutions of the ocean component is about 0.1 degree and 62 levels, respectively.

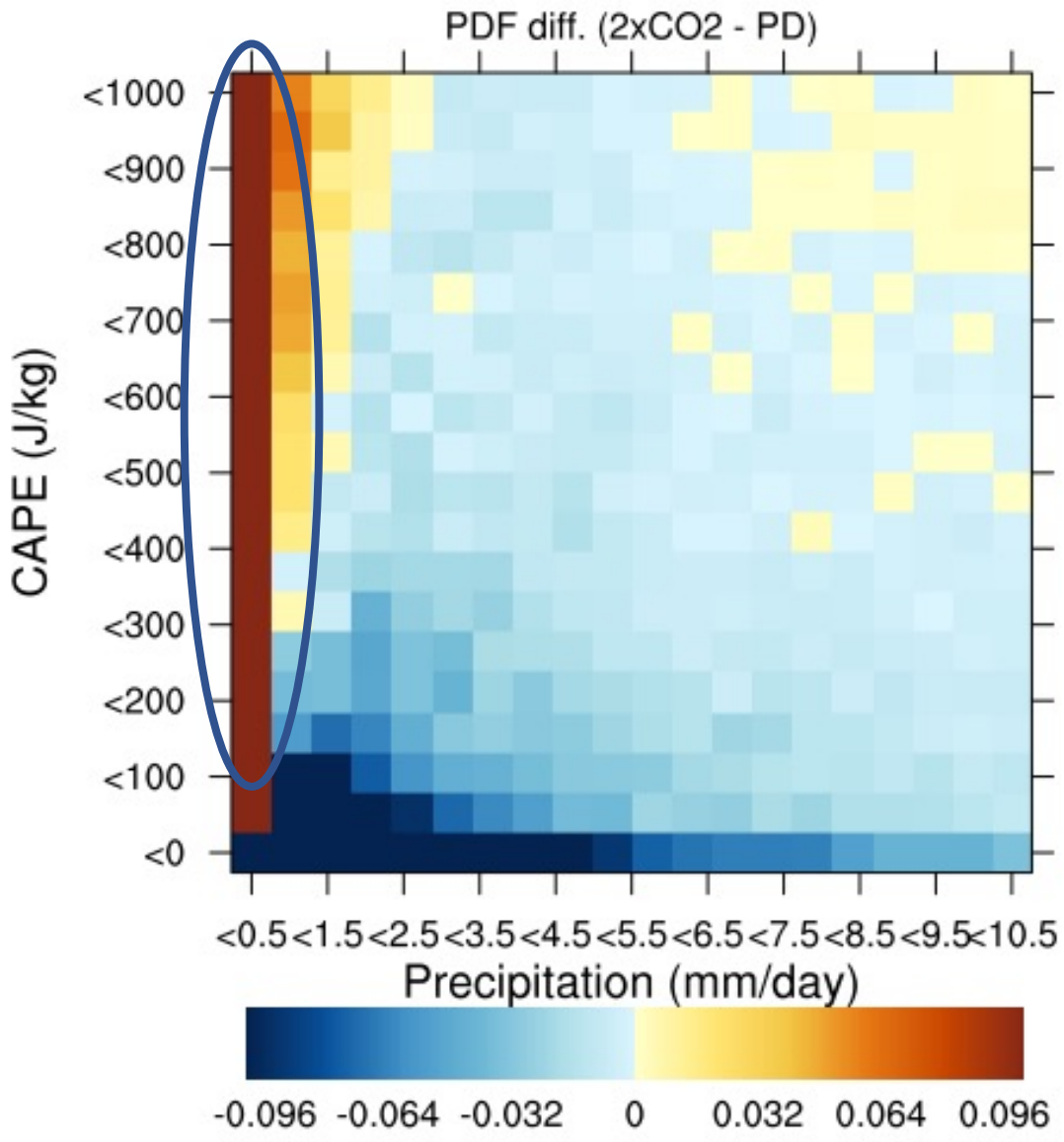




📖 *Chu et al. 2020*

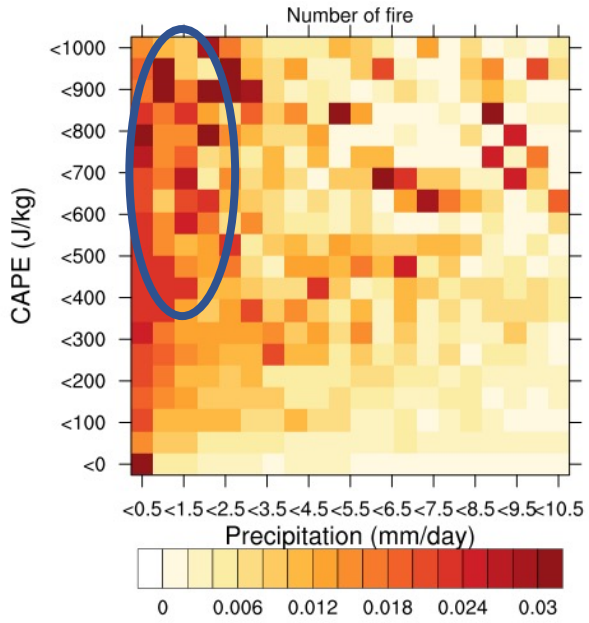
Spatial resolution: ~25 km for ATM model

Dry lightning events are more frequently under GHG warming



Frequency difference between 2 x CO_2 and present day experiments

Observation



University of Zurich[UZH]
jinsoo.kim@uzh.ch

Summary

Recently, Arctic fire events ↑, lightning events ↑

More chance of dry lightning events under greenhouse gas warming scenario