

A34E-04 Examining the Link Between Lightning and Wildfire Ignition Under Climate Change (Invited)

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 16:45 - 17:00 22:45 - 23:00 GMT+2

 152 B (Convention Center)

Abstract

Lightning is the primary source of natural wildfires and is responsible for some of the largest wildfires. Understanding the factors that favor the ignition of wildfires by lightning is essential for modeling their occurrence in chemistry-climate models.

Wildfires produced by lightning tend to occur in dry thunderstorms, that are thunderstorms producing lightning with scarce or zero accumulated precipitation. Other factors such as the fuel moisture conditions - as indicated for instance by the fire danger indices - also concur in determining the probability of wildfire ignition by lightning. There is ongoing discussion about the possible influence of lightning characteristics on the probability of wildfire ignition. Some evidence indicates that continuing current in lightning could increase the probability of ignition. However, the similar lightning ignition efficiency of positive and negative cloud-to-ground lightning reported by some studies suggests that the duration of the continuing current may not be a reliable proxy for the probability of wildfire ignition.

In this study, we investigate the relationships between lightning, wildfires, meteorology and fire danger indices. We combine ground-based Very Low Frequency sensors and the optical space-based instrument Geostationary Lightning Mapper (GLM) to analyze the role of continuing currents in wildfires over the United States. In addition, we use meteorological reanalysis data to investigate the fire danger indices and the precipitation accumulated during the ignition of wildfires by lightning.

We perform simulations with the ECHAM5/MESy Atmospheric Chemistry (EMAC) to determine the role of lightning in wildfire ignition under climate change. According to our modeling results, lightning will increase globally, but lightning with continuing currents lasting more than 10 ms could decrease or stay constant in some particular regions. We analyze non-homogeneous variations in the precipitation accumulated during the occurrence of lightning, humidity, vapor pressure deficit, and temperature. Our results suggest that climate change can produce a significant change in the global pattern of lightning-ignited wildfires. More lightning-ignited wildfires are predicted to occur in mid-latitudes, while the trends in high latitudes are not clear.