EGU2020-8323, updated on 24 Oct 2020
https://doi.org/10.5194/egusphere-egu2020-8323
EGU General Assembly 2020

Influence of Atmospheric Teleconnections on Interannual Variability of Boreal Fires

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Wildfires are common in boreal forests around the world and strongly affect regional ecosystem processes and global carbon cycle. Previous studies have suggested that local climate is a dominant driver of boreal fires. However, the impacts of large-scale atmospheric teleconnection patterns on boreal fires and related physical processes remain largely unclear. This study investigates the influence of nine leading atmospheric teleconnection modes and El Niño-Southern Oscillation (ENSO) on the interannual variability of simultaneous summer fires in the boreal regions based on 1997-2015 GFED4s burned area, NCEP/NCAR atmospheric reanalysis, and HadISST sea surface temperature. Results show that ENSO has only a weak effect on boreal fires, distinct from its robust influence on the tropical fires. Instead, the interannual variability of burned area in the boreal regions is significantly regulated by five teleconnection patterns. Specifically, East Pacific-North Pacific (EP/NP) and East Atlantic/West Russia (EA/WR) patterns affect the burned area in North America, North Atlantic Oscillation (NAO) and East Atlantic (EA) patterns for Asia, and the Pacific-North American (PNA) pattern for Europe. Related to the teleconnections, the larger burned area is attributable to warmer surface by an anomalous high-pressure above and drier surface due to less moisture transport from the neighboring oceans. The results improve our understanding of driving forces of interannual variability of boreal fires and then regional and global carbon budgets.