**Wildfire aerosol climate effect using online fire emission coupling**

**in E3SM**

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**Abstract**

Fire-emitted trace gases and aerosols play important roles in influencing the Earth’s climate system. The changing climate by fires automatically modify fire behavior and production. In this work, we implemented the fire emission coupling in E3SM. The interactive fire module instantaneously release fire aerosols into the atmosphere, which simultaneously modifies radiation and subsequent near-surface climate and exerts feedback on ecosystem productivity and fire productions. The preliminary results show distinct results in day-to-day variability of carbonaceous aerosol burden, aerosol optical depth and incoming solar radiation between the simulation with online fire emission and the simulation with prescribed monthly fire emissions. This result implies that we may expect different fire aerosol climate effects and feedback in either global or regional scale using the newly developed online fire emission module in E3SM.