

FATES-SPITFIRE: Fire within a size-structured vegetation model

J.K. Shuman

R. Fisher

C. Koven

R. Knox

B. Andre

E. Kluzek

The causes and consequences of fire require an understanding of the interaction of climate, vegetation (fuel) and fire. Fire regimes are integral in determining species composition, biomass accumulation, vegetation structure and type. Vegetation type impacts fire regime through changes in fire characteristics such as rate of spread and intensity. Mortality of vegetation due to fire varies according to the type and size of the species affected. Utilizing the Functionally Assembled Terrestrial Ecosystem Simulator (FATES), a demographic vegetation model, and the CESM Earth System Model we explore the impact of vegetation type on fire characteristics. FATES has been updated to use a fire module based on SPITFIRE. FATES-SPITFIRE tracks fire ignition, spread and impact based on fuel state and combustion. Mortality is based on the combined effects of cambial damage and crown scorch due to flame height and fire intensity. As a size-structured model, FATES allows for variable mortality based on the size of tree cohorts, where larger cohorts experience lower mortality compared to small trees. Results for simulation scenarios where vegetation is represented by different types are compared to assess changes in fire regime and characteristics. Vegetation type, size structure, and biomass are key components to representing fire regime. The ability to simulate the vegetation size structure furthers our ability to more accurately represent vegetation change in response to fire disturbance.