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Predictive Fire Emissions in the NASA GEOS-5 Earth System Model

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Fire is a critical component of the Earth system, affecting biogeochemical and hydrological cycles. Fire-weather conditions created by the climatic state, coupled with land surface characteristics and vegetation, determine both the occurrence and spread of fires. Fire activity therefore both affects and is affected by the land-atmosphere system. Presently within GEOS-5, fire emissions are prescribed from observationally-based estimates (e.g., GFED, QFED) or semi-prognostic emissions can be calculated based on local fire weather conditions. Recently, the Catchment land surface model within GEOS-5 has been updated to include prognostic carbon and phenology elements from the National Center for Atmospheric Research (NCAR)/Department of Energy (DOE) Community Land Model 4.5 (CLM4.5) Dynamic Vegetation Model. The new system, Catchment-CN, combines the dynamic phenology elements of CLM4.5 with the water and energy balance from the Catchment LSM. We will show results evaluating the prognostic fire parameterization within CLM4.5 using offline simulations of Catchment-CN using MERRA-2 forcing.