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Can current models reproduce the increase in Western United States Wildfires and project a reliable future trend?

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Wildfires in the western U.S. are generally thought to have increased since the 1980s. Multiple factors have contributed to this increase and scientists have documented the impacts of fire suppression, livestock grazing, and the expansion of urbanization into wildlands. Apart from the anthropogenic impacts on fire regimes, fire occurrence has also been associated with global circulation anomalies linked to variations in sea surface temperatures and described by indices such as El Niño Southern Oscillation (ENSO), the Pacific Decadal Oscillation (PDO), and the Atlantic Multidecadal Oscillation (AMO). Recent analyses have also shown that we may have entered a new fire regime starting with a climate shift in 1998 and are currently entering years of combined long-term warm AMO phase with cool ENSO and PDO phases usually associated with increased drought-induced fires in the interior West. Finally, while the increase in atmospheric CO2 is likely increasing water use efficiency and thus reducing drought stress in western ecosystems, it may also have enhanced fuel build-up as warm temperatures enhance growth and thus contribute to larger fires during extreme drought conditions. We have run our dynamic vegetation model MC1 along a temperature and precipitation gradient on the west coast of the United States at various spatial resolutions (grain) and have documented the relative importance of climate and CO2 on historical fires (1895-2006) using continental (2500km2 pixels), regional (100km2 pixels), and local (0.64km2) climate datasets. We will present some of our results at those various scales, compare them to observations, and discuss scaling issues. We have also simulated future fires (until 2100) estimating the impacts of CO2 and nutrient availability under future scenarios. We will present our results and their relevance to land managers.