Wildfires promoted by contrasting soil moisture anomalies in humid versus arid regions

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Wildfires are essential for ecosystem development, thereby affecting the global carbon cycle. Soil moisture is a major driver of wildfires, however, due to a lack of large-scale observations it remains unclear which spatio-temporal soil moisture patterns promote wildfires. Using satellite-based soil moisture data, we show contrasting soil moisture anomalies preceding the locally largest wildfires in space and time. In arid regions wetter-than-average soils enable sufficient biomass growth required to fuel fires. By contrast, in humid regions fires are typically preceded by dry soil moisture anomalies inducing suitable ignition conditions and flammability in an otherwise too wet environment. In both regions, soil moisture anomalies are continuously decreasing over the months before the fire occurrence, often from above-normal to below-normal. These signals are most pronounced for larger fires in sparsely populated areas with low human influence. Resolving natural soil moisture-fire interactions supports fire modelling and enables improved fire forecasts and early warning.