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Characterizing Wildfire Regimes and Risk in the USA

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Over the last decade, high profile wildfires have resulted in numerous fatalities and loss of infrastructure. Wildfires also have a significant impact on climate and ecosystems, with recent authors emphasizing the need for regional-level examinations of wildfire-regime dynamics and change, and the factors driving them. With implications for hazard management, climate studies, and ecosystem research, there is therefore significant interest in appropriate analysis of historical wildfire databases. Insightful studies using wildfire database statistics exist, but are often hampered by the low spatial and/or temporal resolution of their datasets. In this paper, we use a high-resolution dataset consisting of 88,916 USFS wildfires over the time period 1970–2000, and consider wildfire occurrence across the conterminous USA as a function of ecoregion (land units classified by climate, vegetation, and topography), ignition source (anthropogenic vs. lightning), and decade (1970–1979, 1980–1989, 1990–1999). For the conterminous USA, we (a) find that wildfires exhibit robust frequency-area power-law behavior in 18 different ecoregions, (b) use normalized power-law exponents to compare the scaling of wildfire burned areas between ecoregions, finding a systematic change from east to west, (c) find that wildfires in the eastern third of the USA have higher power-law exponents for anthropogenic vs. lightning ignition sources, and (d) calculate recurrence intervals for wildfires of a given burned area or larger for each ecoregion, allowing for the classification of wildfire regimes for probabilistic hazard estimation in the same vein as is now used for earthquakes. By examining wildfire statistics in a spatially and temporally explicit manner, we are able to present resultant wildfire regime summary statistics and conclusions, along with a probabilistic hazard assessment of wildfire risk at the conterminous USA ecoregion division level.