INITIATIVE ON
Extreme Weather and Climate
COLUMBIA UNIVERSITY

The role of pyrogeographic synthesis in the attribution of climate change to 'unprecedented' fire regimes: the case of the 2016 Tasmanian wilderness fires

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A critical question for understanding the near-term trajectory of biogeochemistry and climate of the Earth system is whether or not fire regimes change in response to anthropogenic climate change. In principle, this question can be resolved through contextualization of fire activity in the past through palaeo-ecological reconstruction and projections of climate and ecological models into the future. Although necessary, neither approach is sufficient to identify 'unprecedented' fire activity in response to climate change in many, arguably most, real world situations. I illustrate this problem with the case of the 2016 Tasmanian wilderness fires that were ignited by intense lightning storms, that burned for 60 days, threatened endemic, fire sensitive Gondwanic vegetation and consumed organic soils that accumulate slowly.

Identification of departures from historical fire regimes in Tasmania are frustrated by (1) poorly resolved, and highly variable, fire history reconstructions and fire-climate proxies, and (2) shallow time-depth of instrumental climate records and landscape fire maps. Key Southern Hemisphere inter-annual climate modes [El Niño–Southern Oscillation (ENSO), Indian Ocean Dipole (IOD) and Southern Annular Mode/ Antarctic Oscillation (SAM/AAO)], which are known to influence dangerous fire seasons in Tasmania, can be predicted by short range forecasts but longer-term climate projections are much less precise, and their interactions poorly understood. Likewise, downscaled climate projections can only weakly identify trends in synoptic weather systems known to drive extreme fire events.

By applying a pyrogeographic synthesis that ties together the constellation of palaeo and neo climatological and ecological data I conclude that the recent Tasmanian wilderness fires are a manifestation of anthropogenic climate change: however this pyrogeographic approach has limited prognostic capacity