CGD SEMINAR

NCAR

DATE: Tuesday 17 December, 2019

TIME: 11 am – 12 pm

LOCATION: NCAR, 1850 Table Mesa Drive
Mesa Lab, Main Seminar Room

TITLE: **Fire, Climate and Humans: A Combustive Combination**

SPEAKER: **Natalie Kehrwald, USGS**

ABSTRACT:

Humans have accidentally and purposefully been lighting fires for at least one million years. As the past one million years encompasses multiple glacial-interglacial cycles with accompanying vegetation changes, climate has dominated the fire history over this time period, even with the contributions of humans. However, over the past 5000 years, human activity can overwhelm the contribution of climate to regional fire activity. Ice cores from northern Greenland (NEEM; 77°27'N; 51°3.6'W), demonstrate a peak in fire activity centered around ~2500 yr BP. This centennial-scale peak in fire activity is determined from the specific biomarkers levoglucosan, mannosan, and galactosan, which can only be produced by cellulose combustion. Fire data from the JSBACH-Spitfire model over the past 5000 years demonstrates that a climate-only scenario would not increase biomass burning in high northern latitudes for the past 5000 years, while NEEM ice core and regional pollen records demonstrate both increased fire activity and land use change that may be ascribed to human activity. New Zealand sediment cores demonstrate a “burn and bolt” strategy, where small bands of humans were able to deforest ~40% of the South Island within a single century. The arrival of the Māori to New Zealand ~800 yr BP introduced fire to a region with essentially no natural biomass burning. Here, we use fecal sterols in lake sediments to determine when people were in an individual watershed, and establish that the increased presence of Māori in an area corresponds with intensified fire activity. Peaks in fecal sterols and biomass burning occur at a single location for approximately two decades. Fire activity and human presence both drop to almost background levels after this initial burning period but then peak in other regional watersheds, demonstrating the migration of groups of people and associated biomass burning. This human-caused increase in New Zealand fire activity is quantifiable in locations as far away as the EPICA Dome C ice core in East Antarctica (75°06'S; 123°21'E). Due to the specificity of these biomarkers, levoglucosan and its isomers can help differentiate between the deposition of fire aerosols versus fossil fuel combustion products on to the surface of glaciers such as the Juneau Icefield (58° 35' N; 134° 29'W). This combination of specific biomarkers, other proxy data, and model output can help determine the relative impact of humans versus climate factors on regional fire activity.

Live webcast: http://ucarconnect.ucar.edu/live

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