Charcoal evidence tracks climate changes in Younger Dryas

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A new study reports that charcoal particles left by wildfires in sediments of 35 North American lake beds don't readily support the theory that comets exploding over the continent 12,900 years ago sparked a cooling period known as the Younger Dryas.

The study -- appearing online this week ahead of regular publication in the *Proceedings of the National Academy of Sciences* -- however, did find clear links between abrupt climate changes and fire activity during the transition between the last Ice Age and the warm interglacial period that began 11,700 years ago. These links are also consistent with the impacts

of climate-change conditions on wildfires during recent decades in North America, the researchers noted.

Charcoal particles, along with tree pollen, provide snapshots of types of vegetation and frequencies of wildfire activity in a given area, said study co-author Patrick J. Bartlein, a professor of geography at the University of Oregon. His doctoral student Jennifer R. Marlon led the collaborative study of 23 co-authors (including seven current or former UO students) at institutions in the U.S., Canada and Europe.

"The charcoal data don't support the idea of widespread fires at the beginning of the Younger Dryas interval," Bartlein said. "The results don't reject the comet hypothesis, but do suggest that one element of it -- widespread fires -- didn't occur. Instead, the data show that biomass burning tracked general climate changes closely. Biomass burning increased as conditions warmed during deglaciation until the beginning of the Younger Dryas cold interval at 12,900 years ago, leveled off during the cool interval, and then increased again as warming resumed after the end of the cold interval, about 11,700 years ago."

The fires that left the charcoal records reflect the impact of climate changes independent of potential contributions of early Paleoindians who may have been living on the continent. Proponents of the comet theory suggest Clovis culture may have been dramatically disrupted across the continent.

Marlon began the National Science Foundation-sponsored study of charcoal-pollen records soon after the comet theory was proposed in PNAS by an international team of 26 researchers led by Richard B. Firestone. A co-author of that study, UO archaeologist Douglas Kennett, in the Jan. 2 issue of Science, documented the existence of possible comet-triggered nanodiamond-rich soil at six North American sites dating to 12,900 years ago in apparent support of the hypothesis. The

formation of nanodiamonds requires intense pressure and heat, much higher than those of biomass wildfires but possible in comet explosions.

"We had the data to look for widespread fires if they had occurred," Marlon said, "but what we saw instead was a general increase in biomass burning whenever the climate warmed."

The lakes containing the charcoal are in Alaska (3 sites), British Columbia (7), U.S. Pacific Northwest (6), the Sierra Nevada (3), northern U.S. Rocky Mountains (6), Southwest (4), Midwest (2), Northeast (3 sites in Quebec), and Southeast (1). Thirty of the samples came from the Global Charcoal Database; another five were drawn from more recent research by co-authors currently studying sediments from the Younger Dryas.

The new study's conclusion that climate is a major control of wildfires matched that of a study published last year in Nature Geosciences by the same researchers on global biomass burning over the last 2,000 years. "Together," Bartlein said, "these studies suggest that episodes of global warming are accompanied by increases in wildfires."

Source: University of Oregon