Geophysical Research Abstracts
Vol. 13, EGU2011-11310, 2011
EGU General Assembly 2011
© Author(s) 2011

# Polar and tropical ice cores record fire activity across present and previous interglacial cycles

Natalie Kehrwald (1), Elena Barbaro (2), Paolo Gabrielli (3), Andrea Gambaro (1,2), Lonnie Thompson (3), Roberta Zangrando (1), Piero Zennaro (2), Carlo Barbante (1,2)

(1) IPCA-CNR, Venice, Italy (kehrwald@unive.it, barbante@unive.it, gambaro@unive.it, rozangra@unive.it, +39 041 2578549), (2) University of Venice, Department of Environmental Science, Venice, Italy (barbaro@unive.it, piero@unive.it, +39 0412348549), (3) Byrd Polar Research Center, The Ohio State University, Columbus, Ohio, USA (gabrielli.1@osu.edu, thompson.3@osu.edu, +01 614 2924697)

Fires affect the global carbon cycle through changing vegetation distribution, primary productivity, biodiversity, and atmospheric chemistry. Biomass burning caused by current human activities emits up to 50% as much carbon dioxide as fossil-fuel combustion and is therefore highly likely to influence future climate change. Ice cores contain specific molecular markers including levoglucosan (1,6-anhydro-$\beta$-D-glucopyranose) and other pyrochemical evidence that provides much-needed information on the role of fire in driving past climate and the possibility of current biomass burning affecting future global climate. Woody biomass burning at temperatures above 300°C injects levoglucosan into smoke plumes than can disperse through the global atmosphere. While a percentage of levoglucosan does degrade in smoke plumes, the high concentration of levoglucosan emissions suggests that levoglucosan is a viable tracer for biomass burning.

The study of past fire activity using ice core records opens regions of the world where no paleofire data previously exited. Polar and low-latitude, high-altitude ice cores provide data for regions which are not represented in the global charcoal database. The available temporal resolution matches that of the ice core, with the longest temporal resolution being that of the EPICA Dome C ice core that extends back approximately eight glacial cycles. The spatial resolution of chemical markers in ice cores depends on the location of the core itself. Low-latitude ice cores primarily reflect regional climate parameters, while polar ice cores reflect a global signal. Here, we present levoglucosan flux measured across the past 600,000 years in the EPICA Dome C (75°06'S, 123°21'E, 3233 masl) ice core, during the late Holocene in the Kilimanjaro (3°04.6'S; 37°21.2'E, 5893 masl)ice core, and the applicability for determining levoglucosan in the NEEM, Greenland (77°27' N; 51°3'W, 2454 masl) ice core.