

# REPORT ON PALAEOFIRE WORKSHOP

17-21<sup>st</sup> November 2008

Queens Court, Exeter, UK

## Motivation for Workshop

In previous GPWG workshops we have focused on the synthesis of charcoal records for the last 21ka (Workshop 1: Power et al., 2008), and the analysis of composite records of the past 2000 years (Workshop 2: Marlon et al., 2008). The aim of the third workshop was to extend the time-series type analyses developed for Marlon et al. (2008) to examine the composite global/hemispheric/continental-scale patterns in fire over the past 21,000 years and then to explore the degree to which the broad-scale patterns could be explained by changes in external forcing. The workshop also considered the potential contribution of these records to understanding global biogeochemical changes during the past 21,000 years.

## Workshop Achievements

- 1) The workshop brought together 12 international experts on palaeofire with different perspectives and investigative techniques for reconstructing Quaternary fire histories (see Appendix A) to analyse changes in global fire regimes over the past 21,000 years.
- 2) *Data Collection.* Prior to the workshop, members of the GPWG were responsible for identifying new sites to be included in an updated version of the Global Charcoal Database (GCD). GCDv1 was publically released after the publication of the Power et al. (2008) paper and contained 405 sites. The new version of the database, GCDv2, contains nearly double this number of sites. Some further clean-ups of the GCDv2 are required, but it is anticipated that a definitive version of the database will be ready by February 2009.
- 3) The major focus on the Exeter workshop was on the *global evolution of fire regimes over the past 21,000 years*. Our analyses show:
  - a. The long-term trend shows a gradual increase in fire over the past 21,000 years, with low fire activity in the glacial and higher increasing fire activity during the Holocene. Millennial-scale variability is also evident in this composite time series.
  - b. Changes in Northern and Southern hemisphere fire activity track the hemispheric temperature curves (respectively GISP, EPICA)
  - c. The Northern and Southern tropics show opposite trends during the early Holocene, which is apparently related to the insolation-driven changes in N and S monsoons (i.e. a moisture-driven fire signal)
  - d. The “broken hockey stick” of the 19<sup>th</sup> and 20<sup>th</sup> century is still apparent in the expanded data set

These results will be the subject of a joint-authored paper, the production of which will be spearheaded by Anne-Laure Daniau and Willy Tinner.

- 4) A secondary focus of the Exeter workshop was on the analysis of *fire regimes in Australasia and the Pacific over the past 150,000 years*, in part motivated

by a desire to examine whether fire regimes changed with human colonization (at ca 45,000 years in Australia, significantly later in the Pacific islands). These analyses show:

- a. The long-term record of fire reflects interglacial-glacial changes in climate
- b. There is no fundamental change in fire regime with the arrival of humans in Australia
- c. The record of the past 21,000 years shows millennial-scale variability, and a complex interaction between climate, vegetation change and fuel-limitation in the control on regional fire regimes

These results will be the subject of a joint-authored paper, the production of which will be spearheaded by Scott Mooney and Janelle Stevenson.

5) *Operational plan.* Workshop participants discussed future workshop activities of the GPWG. It was decided that highest priority should be given to organising:

- a. A data-model comparison workshop in the UK in early spring 2009. This small workshop will focus on comparing results from the LPJ-SPITFIRE model from the mid-Holocene and Last Glacial Maximum with charcoal records from the GCDv2.
- b. A workshop exploring the use of marine charcoal records to reconstruct changes over multiple glacial-interglacial cycles, to be held in collaboration with the QUEST Working Group for Abrupt Climate Changes in autumn 2009.
- c. A GPWG Open Science Meeting in 2010. This will be open to all GPWG members who wish to attend, and will be organized by Mitch Power and held in Utah.

6) *Future analyses.* Workshop participants discussed future analyses and publications arising from the improved database. There are a number of projects outlined on the GPWG webpage; contacting the leaders of these projects for an update on progress is a vital next step. Participants also agreed that it is important to solicit suggestions from the wider GPWG membership about future analyses. However, there was clear agreement on a number of future analyses, including:

- a. Analysis of the policy-relevance of the palaeo-record of fire. Sandy will be presenting a summary of the “rules of (palaeo-)fire” at AGU this year, and this could form the kernel of a policy-oriented paper. There is also considerable interest in a policy-related paper based on the Australasian analyses.
- b. Analysis of the palaeo-record of ENSO and fire
- c. Analysis of charcoal records covering the last climatic cycle.

## Appendix A: List of Attendees

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