Assumptions about importance of modern wildfires wrong, study shows

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(PhysOrg.com) -- An assumption that wildfires are at a record high today has been incorporated into scenarios used for projections of future climate change. However, several recent analyses of palaeoenvironmental data show that the assumption is quite wrong, according to Macquarie University biological scientists, Professors I. Colin Prentice and Sandy Harrison.

Two years ago, a team led by Jenn Marlon (University of Oregon) and including scientists from Macquarie University, analysed sedimentary charcoal records of changing fire regimes during the past two thousand years. They showed that global biomass burning declined over this period until the Little Ice Age (ca 1750 AD), increased during the 19th

century, and then decreased again during the 20th century. They found that biomass burning levels were lower today than at any previous time in the last two thousand years.

Marlon's team suggested that the 20th century decrease was a result of vegetation cover becoming fragmented, due to large-scale crop-growing and grazing. The phenomenon was already well known in the western United States, where it has been attributed to the widespread adoption of European farming practices.

An international team, led by scientists at the University of New South Wales and Macquarie University, has now repeated the analysis done by Marlon's team, but focusing on Australasia. Their work confirms that both the climatically driven increase in fire after the end of the Little Ice Age, and the 20th century decrease in fire, are present in the charcoal records from Australasia.

There is another source of information that is completely independent of charcoal records. Biomass burning contributes a small amount of carbon monoxide in the atmosphere, which can be measured with high precision using mass spectrometers. Carbon monoxide is also produced by fossil fuel burning, and by the oxidation of naturally occurring hydrocarbons, but the relative contribution of the different sources can also be estimated using high-precision measurements of the stable isotopes of carbon and oxygen in carbon monoxide. A new record of changes over the past 650 years in the concentration and isotopic composition of carbon monoxide trapped in air bubbles in the ice of Antarctica, published this week in Science, shows a very similar pattern of changes to those reconstructed from charcoal records. Together with measurements of modern carbon monoxide and its isotopes, these records confirm that biomass burning (in the southern hemisphere) is at a historic low.

Writing in *Science* about this new ice-core paper, Prentice (a member of the Concentration of Research Excellence in Ecology and Evolution at Macquarie, and of the team that analysed the global charcoal records) has drawn attention to the close similarity between the ice-core and charcoal stories of biomass burning.

He points out that the palaeo-record provides crucial insights into the behaviour of many aspects of climate and environmental changes that cannot be gleaned from the very short observational records and, as in the case of biomass burning, may overturn widely held beliefs.

Knowing that fire is at a historic low has implications for how to deal with fire in the future, Prentice and Harrison say. It is predicted that wildfires will increase in the near-term, because of the warming and drying trends which have already started and are expected to continue. But policies are being discussed for carbon sequestration, and even biodiversity conservation, that involve rebuilding continuous forests and thereby defragmenting parts of the Australian landscape—potentially making the fire hazard worse, and the new forests susceptible to being burnt down again. This trade-off has barely been considered in the scramble to "offset" fossil fuel carbon emissions by storing carbon on land.

Provided by Macquarie University