PROGRESS REPORT FOR AINGRA06129

PROJECT TITLE
Comparative ages of pollen and foraminifera in deep sea sediments

INVESTIGATOR(S)

Chief Investigator
Dr Patrick Moss
Geography, Planning & Architecture, The University of Queensland

Other Investigators
Dr Gavin Dunbar, Postdoctoral Fellow at Research School of Earth Sciences, Australian National University, email: gavin.dunbar@anu.edu.au
Dr Gerald Dickens, Department of Earth Science, Rice University, Houston, Texas 77251-1892, USA, email: jerry@ric

Students

ANSTO Investigators
Dr Geraldine Jacobsen

SCIENTIFIC OBJECTIVES

We propose addressing the question of reworking, and consequent time lag between production and deposition of pollen in the Queensland Trough, by 14C dating selected palynomorph material from the same stratigraphic horizons in ODP core 820 where foraminfera have previously been dated by AMS 14C and shown in Table 1 (Peerdeman, 1993). The results would contribute to our ability to interpret marine palynological records and provide additional insight into the sedimentological processes operating on the continental margin.

PROGRESS REPORT and RESEARCH OUTCOMES

The 10 ages granted in 2006 for AMS C14 dating of pollen concentrates derived from sediments from the Ocean Drilling Program (ODP) 820 marine core have now been received. The results provide a good age control for the climatic and environmental changes preserved in the terrestrial record for the period dated. A reservoir correction of 375 years was subtracted from the reported age and the marine calibration of Fairbanks et al., 2005, and the online calculator at http://www.radiocarbon.ldeo.columbia.edu/

There was an expectation in finding the pollen concentrate ages to be similar to, or older than, existing foraminifera ages from the same core depth, as foraminifera have life spans of ~months and settle rapidly to the seabed after death, with the magnitude of the age difference being dependent on a number of factors, including sea level and fluvial discharge rates. If production and transport of pollen and foraminifera are the only mechanisms controlling the relative ages of each in the ODP 820 core, pollen can not be younger than foraminifera recovered from the same core depth. Table 1 shows that the Holocene ages for both the foraminifera and pollen are consistent with this theory. However, the Last Glacial Maximum (LGM)/Marine Isotope Stage (MIS) 3 ages are not, with the pollen ages being significantly younger than the foraminifera ages. Importantly, the age discrepancy is most pronounced during what has previously been interpreted as the period from MIS 4 through to MIS 2. However, dating this interval at ODP site 820 has proved difficult due to ambiguities in oxygen isotope and biostratigraphic datum as well as large, abrupt, changes in sedimentation rate and composition (e.g. Peerdeman et al., 1993; Peerdeman and Davies 1993). Evidence of a significant vegetation change (decline in araucarian taxa, increase in myrtaceous taxa) occurred in the ODP record at 15 m and suggests that the terrestrial sediments in the ODP 820 record are providing a continuous record through the Late Pleistocene period, as this alteration is very similar to one seen in the Lynch’s Crater record and has been dated to around 45,000 years BP (Turney et al. 2001). These results suggest that there is some unreliability associated with the initial foraminifera AMS C14 dates and there have been some reports that the foraminifera in the ODP 820 record may have undergone some diagenesis, which may have impacted the reliability of the foraminifera ages around 7 to 8 mbsf (metres below sea floor) (Peerdeman, 1993; Lawrence and Herbert, 2005). However, the generation of good age control through AMS C14 dating of the pollen concentrate provides the potential to extend radiocarbon dating through the deeper ODP 820 sediments and resolve uncertainty...
in the age model. This in turn will greatly improve our understanding of environmental change in the humid tropics region during a period of time that also likely included the arrival of people in North Queensland.

We are currently exploring the sedimentological implications of the above trends (i.e. significant difference between the dates from the pollen concentrate and foraminifera) and once completed intend to prepare a manuscript for publication. Funding through AINSE has provided the necessary resources to provide greater insight into this significant record and present the results to the international scientific community.

References:


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**Table 1:** Comparison between pollen concentrate and foram ages (AMS C$^{14}$), calibrations. Foraminifera: A reservoir correction of 375 years was subtracted from the reported age and the marine calibration of Fairbanks, et al., 2005 and the online calculator at [http://www.radiocarbon.ldeo.columbia.edu/](http://www.radiocarbon.ldeo.columbia.edu/). *P+D = Peerdeman and Davies, 1993.*