The Holocene Radiocarbon Reservoir Effect in the Western Ross Sea

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The chronology of Holocene deglaciation of the Ross Sea Embayment (Conway et al., 1999) relies, in part, on radiocarbon dates of marine materials. These dates must be corrected for a marine reservoir effect caused by upwelling of water that has been out of contact with the atmosphere. Dating of historical samples (i.e., collected before the formation of ^{14}C by nuclear weapons testing) reveals that the modern reservoir effect is approximately 1300 years (Berkman and Forman, 1996 and others). However, temporal variations are possible, particularly if changes in ocean circulation have occurred. Application of today's correction of 1300 years to ancient samples potentially could introduce error of several hundred years.

To document any Holocene variations in the marine reservoir effect we analysed solitary corals from the western Ross Sea by both the radiocarbon and uranium-thorium disequilibrium methods. U/Th dates should be the true ages of the samples. The offset, therefore, between the radiocarbon date (converted to calendar years) and the U/Th age for the same sample, gives the radiocarbon reservoir effect at that time. We have performed paired analyses on more than 40 solitary corals that span the past 6500 years. Our preliminary data indicate that the radiocarbon reservoir effect has remained virtually unchanged throughout this time (~1250 +/- 150 years). This stability validates previous application of the modern correction (1300 years) to ancient samples. It also suggests that the Ross Sea region has not experienced any changes in ocean circulation detectable by radiocarbon variations in the last 6500 years.

Berkman, P., and Forman, S., 1996. Pre-bomb radiocarbon and the reservoir correction for calcareous marine species in the Southern Ocean. Geophysical Research Letters, v. 23, p. 363-365.

Conway, H., Hall, B., Denton, G., Gades, A., and Waddington, E., 1999. Past and future grounding-line retreat of the West Antarctic Ice Sheet. Science, v. 286, p. 280-283.