## AMS MEASUREMENTS OF THE $^{14}C$ DISTRIBUTION IN THE PACIFIC OCEAN

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Over the last 5 yr, the National Ocean Sciences AMS Facility at Woods Hole Oceanographic Institution has analyzed over 3700 seawater samples from World Ocean Circulation Experiment (WOCE) cruises[1] in the Pacific Ocean. The data set accumulated so far covers a major part of the ocean basin with emphasis on the upper water column (0–2000 m). Statistical aspects of the data analysis will be discussed as well as database related issues. We will present a three-dimensional model of the current $^{14}C$ distribution in the region of coverage. Using this model, we will attempt to quantify the $^{14}C$ transport in comparison with GEOSECS data from 1973.

[1]Principal investigators for AMS: R. Key, P. Quay, R. Toggweiler and P. Schlosser

## PROGRESS OF THE NOSAMS FACILITY WOCE $^{14}C$ DATA ANALYSIS

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The NOSAMS facility has processed over 3700 WOCE[1] Pacific seawater samples so far. In comparison, during GEOSECS a total of 876 Pacific large volume samples were collected and analyzed. The 20-yr progression of the $^{14}C$ distribution from GEOSECS to WOCE will be shown for overlapping stations. We will discuss the status of the operations and give a preview of the results to be presented at AMS-7.

[1]Principal investigators for AMS: R. Key, P. Quay, R. Toggweiler and P. Schlosser

## EVOLUTION OF $\Delta^{14}C$ IN THE SURFACE NORTH ATLANTIC OCEAN

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Recent work using accelerator mass spectrometry (AMS) and micro-sampling methods has shown that the carbonate shell of the long-lived mollusc (Bivalvia) *Arctica islandica* can be used to reconstruct long-term, high-resolution $\Delta^{14}C$ time series for the colder, higher-latitude northern North Atlantic Ocean (Weidman and Jones 1993). Here, time histories of the ocean's bomb-$^{14}C$ signal from three sites in the northeastern North Atlantic Ocean (southern North Sea, northern Norway, northern Iceland) are reported. These records, combined with previously published *Arctica islandica*-derived (Weidman and Jones 1993) and coral-derived $\Delta^{14}C$ time histories (Druffel 1989), now permit a more complete overview of the evolution of the radiocarbon signal in surface North Atlantic Ocean than has been previously possible.

Pre-bomb (~1950) surface North Atlantic $\Delta^{14}C$ values average –59‰, and are most depleted in the Labrador Sea (~ –70‰) and most enriched in the Sargasso Sea (~ –50‰). North Sea and Norway

pre-bomb signals now show large depletions (~30‰) in the 1950s relative to the 1940s, perhaps related to the Suess effect. However, the Iceland pre-bomb signal shows no depletion at all.

Initial appearance of the bomb-$^{14}C$ is synchronous in all North Atlantic $\Delta^{14}C$ *ca.* 1959 (± 1 yr). All North Atlantic $\Delta^{14}C$ records show a steep rise during the early-to-mid 1960s and reach maxima in the late 1960s to late 1970s. The North Sea record has the largest bomb-signal amplitude (~320‰) and the Iceland record has the smallest (~120‰). The prolonged residence time of shallow shelf water is suspected to have caused the extremely large amplitude and advanced phase of the North Sea signal relative to their North Atlantic signals. The North Atlantic bomb-$^{14}C$ signals show a sharp contrast between regions influenced by the subtropical gyre (Florida, Bermuda, North Sea) with the former being more depleted. These results likely reflect the contrast between the depths of the winter mixed-layer in the northern and southern regions (Robinson *et al.* 1979), but are also consistent with a depleted or deepwater contribution to the subpolar gyre (Tsuchiya 1989). A small east-west difference in the relative enrichment of the Norwegian signal *versus* the Georges Bank and Iceland signals is also in agreement with deeper mixing in the western section of the subpolar gyre, and the poleward advection of surface Atlantic water into the Norwegian Sea.

### References

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Robinson, M. K., Bauer, R. A. and Schroeder, E. H. 1979 Naval Oceanographic Office Reference Publication 18.
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## A THEORETICAL STUDY OF SOME NEGATIVE IONS OF INTEREST TO ACCELERATOR MASS SPECTROMETRY

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Recent experiments and theoretical calculations provide evidence that many atoms with closed subshells form stable negative ions. This was quite unexpected, since it had long been believed that these atoms, for example Ca, Sr and Ba, could not bind an extra electron to form stable negative ions. This view was abandoned with the prediction and observation of stable $Ca^-$, $Sr^-$, $Ba^-$ and $Ra^-$.

The purpose of the present work is to study the stability of negative ions, many of which are of interest and importance for AMS. In particular, the effects of interactions between valence electrons and relativity on $Ca^-$, $Ba^-$, $Au^-$, $Al^-$, $Tl^-$ and many other ions have been investigated.

## THE GRONINGEN AMS TANDETRON

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The second machine of the so-called third generation AMS (employing simultaneous injection through a recombinator) is now in operation at Groningen for *ca.* 2 yr. The machine was built by HVEE in Amersfoort and is dedicated to $^{14}C$ analysis.