A NEGATIVE SURFACE IONIZATION SOURCE FOR AMS

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For isotopes with large electronegativities ($^{129}$I, $^{36}$Cl) a negative ion source based on surface ionization is potentially very attractive, both from the point of view of efficiency, and/or selectivity from interfering isobars. We have constructed a prototype source based on this principle, using a heated surface of LaB$_6$ or BaO. We have carried out preliminary tests of the source on the isotope separator SIDONIE using samples prepared from stable iodine (AgI).

The results demonstrate the feasibility of using small samples (<60 µg iodine) and efficiencies of >1%. This opens up the possibility of measuring $^{129}$I/$^{127}$I ratios directly from 1 liter ocean water samples, without addition of carrier.

$^{10}$Be AND DUST IN POLAR ICE

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The dust content of today's precipitation in the polar regions of the Earth is so small that the contribution of recycled, dust-bound $^{10}$Be to the total $^{10}$Be signal in polar snow and ice is generally regarded to be negligible. During the last ice age, however, dust fluxes were larger than today by at least one order of magnitude. One is therefore forced to examine the relevance of dust as a source of $^{10}$Be in polar ice cores. New experimental data from the Summit GRIP ice core suggest that the ratio of dust adsorbed $^{10}$Be to the total $^{10}$Be content is much larger than expected, since the $^{10}$Be concentration of the dust is very high. The dust contribution to the $^{10}$Be signal, therefore, cannot be neglected. Its knowledge is necessary for a thorough interpretation of the whole $^{10}$Be record.

These unexpected findings lead to some fundamental questions about possible interferences between the two sources of $^{10}$Be in precipitation, i.e., dust with recycled $^{10}$Be and aerosols with recently produced $^{10}$Be. The question has to be addressed, under which conditions the two sources for $^{10}$Be can be separated at all. A status report on actual problems and possible solutions will be given.

STATUS OF THE NSF-ARIZONA AMS LABORATORY


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In this paper we will present a summary of the activities at the NSF-Arizona AMS laboratory over the past year. In addition to a description of some of the measurements, the summary will include details of: 1) latest results concerning precision and accuracy of radiocarbon measurements; 2) mea-
surements of, and corrections for, δ13C values; 3) corrections to 14C measurements for contamination introduced in sample preparation; 4) dependence of 14C ages on sample size and target composition; 5) properties of 10Be measurements; 6) a recent modification to the accelerator; and 7) planned future additions to the instrument. The particular modification to be discussed is the installation and operating characteristics of an insulator which supports the high-voltage terminal. This insulator allows us to decrease the stresses on the delrin rods which are used to maintain the accelerator tubes under compression.

HIGH FREQUENCY RADIOCARBON VARIATIONS IN PACIFIC CORALS

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Modern corals from the western Pacific Ocean reveal substantial seasonal cycles in Δ14C when sampled at a monthly frequency. GCM model results suggest that a significant portion of these seasonal cycles may be advected from the equatorial Pacific region, as opposed to being of local origin. Coupled U/Th and 14C measurements on a long-lived (700 yr) Younger Dryas (YD) age coral reveal periodic inter-annual to decadal scale variability in ocean surface water Δ14C, with variations of 10–40‰ amplitudes. These periodic variations are superimposed on a long period 150‰ drop in Δ14C which occurred during the YD. Carbon box model results suggest that such changes cannot plausibly be produced by changes in the Earth’s magnetic field intensity, but that it is possible to produce such variations solely by modulating the thermohaline circulation flux associated with NADW.

36Cl VARIATIONS IN GREENLAND ICE SINCE 1425 AD

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36Cl was measured in 470 samples of a 300-m-long ice core from Dye 3, Greenland, which has been analyzed previously for 10Be. The 36Cl record has an annual resolution and reveals interesting features. The solar modulation is reflected in the Schwabe sunspot cycle as well as in the 90-yr Gleissberg cycle. The Maunder and the Spoerer minima are also present. In the 1950s the 36Cl concentration was increased dramatically by nuclear bomb tests.

A detailed comparison between 36Cl and 10Be measured on the same pre-bomb samples shows a relatively high similarity of the basic features of both records. However, on the average 36Cl lags behind 10Be by about one year. This points to a longer atmospheric residence time of 36Cl compared to 10Be and provides some hints to atmospheric transport processes.

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WEAKLY BOUND NEGATIVE IONS STUDIED BY LASER EXCITATION AND AMS

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Properties of weakly bound elemental and molecular negative ions (electron affinity and photodetachment cross section) are measured by combination of laser excitation and AMS techniques. The photodetachment cross section is determined by measuring the depletion of negative ions through