AMS OF THE PLANETARY ELEMENTS

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The detection of long-lived plutonium and neptunium isotopes by AMS at high sensitivity has been demonstrated with the 14UD accelerator at the Australian National University. Possible applications include nuclear safeguards and waste disposal issues, the biogeochemical behavior of these elements following release into the environment, and the biochemistry of plutonium. Briefly, the methodology is as follows: the plutonium or neptunium is dispersed in iron oxide and PuO − 2 or NpO − 2 ions extracted from a SNICS high-intensity source. Gas stripping is employed, and to date the 7+ charge state has been selected for analysis. The choice of accelerating voltage is dictated by the maximum mass-energy product (135 MeV-amu) of the high-energy beam transport system, which for Pu7+ ions corresponds to an energy of 28 MeV and a terminal voltage of 3.5 MV. Pu and Np ions are detected in a propane-filled ionization detector in which the electric field is parallel to the direction of the incoming ions. An energy resolution of 3.1% is achieved for 28 MeV actinide ions which is more than adequate to resolve the Pu and Np from all charge-exchanged ions with the exception of other actinides, principally 238U.

A number of tests of the system have been performed and show that it is capable of quantitative measurement of isotope ratios for these very heavy elements. Backgrounds are very low. First measurements for projects to study the distribution of Np in pore waters from mud flats in the vicinity of the Sellafield reprocessing plant in Cumbria and to measure the Pu levels in people living near the plant are underway. Preliminary results will be presented. In addition, the prospects for improvements in performance will be discussed.

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10Be MEASUREMENTS AT THE ANTARES AMS FACILITY

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Measurements of 10Be have commenced at the ANTARES AMS facility. First results compare very well with that obtained at other AMS laboratories routinely measuring 10Be. Plans are to increase the 10Be measurement program through 1996 related to projects in the Earth Sciences (geomorphology, subduction and ice cores).

A conventional gas ionization detector (using P10) preceded by an Ar absorber cell with Havar windows, a TV of 5.6 MV and selection of the 3+ charge state were used to identify 10Be. Particle transmission (using C stripper foils) was 15–20% and future work will employ our new gas stripper. The injector magnet was bounced at 2 Hz (50 msec 9Be, 450 msec 10Be) with 10Be/9Be ratios presented at 2–3-min intervals.

Blank BeO produced from dissolved beryl consistently gave 10/9 ratios of 1 × 10 −14 while that from our commercial BeO ranged from 5–7 × 10 −14. Four standards (3 kindly supplied by S. Vogt from PRIME lab and one from University of Pennsylvania), ranging from 1 × 10 −11 to 1 × 10 −8, were mea-