VERA: A NEW AMS FACILITY IN VIENNA

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VERA is an acronym for Vienna Environmental Research Accelerator, a new center for accelerator mass spectrometry associated with the Institut für Radiumforschung und Kernphysik at the University of Vienna. The name of the facility indicates its primary mission, *i.e.,* the tracing of long-lived natural and artificial radionuclides in the five domains of our environment: atmosphere, biosphere, hydrosphere, cryosphere and lithosphere.

VERA is housed in a small two-story palace from the last century under landmark protection, whose interior was completely reconstructed to generate a modern laboratory for AMS. At the same time, efforts were made to preserve the original features of the building as much as possible. The total floor space available (~600 m^2) was divided into four areas of roughly equal size: accelerator, mechanics and electronics shops, sample preparation, and offices including a seminar room. Particular emphasis was placed on providing ample space for sample preparation.

VERA is based on an AMS facility built by National Electrostatics Corporation in Wisconsin, USA. An important design feature is the capability of transporting ions up to the heaviest elements. The main components of VERA are a 40-sample Cs-beam sputter source, a 45-degree spherical electrostatic analyzer, a double-focusing 90-degree injection magnet with an insulated vacuum chamber for fast sequential isotope injection, a 3-MV pelletron tandem accelerator, a double focusing 90-degree analyzing magnet with a mass-energy product of 176 MeV amu, and a Wien Filter. Several different particle detector systems are under construction in Vienna. VERA is fully computer-controlled and integrated into the Internet, thus providing the possibility to interact with it from essentially any place on Earth.

VERA will initially be used to perform AMS measurements of ^{10}Be, ^{14}C, and ^{26}Al. In a second phase, suitable peripherals will be developed to utilize the full mass range of radionuclides. In this report, an overview of the facility with its current status and prospects for the future will be presented.

RADIOCARBON AMS DATING OF THE SITES WITH EARLY POTTERY FROM THE RUSSIAN FAR EAST

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We recently obtained radiocarbon AMS dates from two key sites in the Russian Far East, lower Amur River basin, Gasya and Khummi. They both contain the earliest remains of archaeological pottery, and belong to the Osipovka culture of Incipient Neolithic.

At the Gasya site (48°45′N, 135°40′E), charcoal collected from the hearth is associated with pottery (depth 2.1–2.4 m below surface) that was dated using conventional decay counting to 12,960 ± 120 BP, LE-1781. The other charcoal sample (depth 1.4–1.6 m) was AMS dated to 10,875 ± 90 BP, AA-13393.

At the Khummi site (50°34′N, 137°06′E), a conventional ^{14}C date associated with the upper level of the Osipovka stratum is 7,760 ± 120 BP, GIN-6945. Another charcoal sample from this level was AMS dated to 10,345 ± 110 BP, AA-13391. The second AMS date from the lower level of the Osi-

povka stratum is 13,260 ± 100 BP, AA-13392. Charcoal collected without close association with artifacts and located 1 m away from any artifacts was AMS dated to 42,800 ± 1,900 BP, AA-13394.

These new ^{14}C AMS dates allow us to suggest that the appearance of pottery in the Incipient Neolithic of the lower Amur River basin could be as early as *ca.* 13,000–13,200 BP. Both the Gasya and Khummi sites have similar ^{14}C dates to the Fukui Cave and Kamikuriowa site in southern Japan (12,200–12,700 BP). Thus, the pottery appeared in the Russian Far East at a similar time to that in the southern Japanese Islands.

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RADIOCARBON IN MARINE DISSOLVED ORGANIC MATTER

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Dissolved organic carbon is the largest active reservoir of reduced carbon on Earth. It is defined as all organic material in water that passes a 0.2 micrometer filter. Part of the DOC is biologically active (young) and plays an important role in the ecology of surface waters as food source for bacteria (the microbial loop) and in the distribution of nutrients and carbon in the water column. Another part of DOC appears to be very refractive (old) and is present as a background for prolonged periods.

Analytically it is a very difficult property to measure because of its high chemical stability and its low concentration and consequent blank problems. We have developed a new method for oxidation of DOC and the recovery of the CO_2 for isotopic measurement. We use the supercritical phase as oxidation medium to ensure a complete oxidation and prevent problems with salt precipitation. This method is used for isotopic measurement of the DOC (^{13}C, ^{14}C). Knowledge of the ^{14}C content gives insight into the relation between old and young DOC and the dynamics of the old pool. At the conference this method and its first results will be presented.

FIELD VARIABILITY OF CARBON ISOTOPES IN SOIL ORGANIC CARBON

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The question of homogeneity of carbon isotopic composition of soil organic carbon becomes critical when trying to obtain some representative value for a site, and especially when attempting to quantify small changes in the isotopic composition in these carbon pools over time. Several years of free-air CO_2 enrichment (FACE) experimentation have been done at the Maricopa Agricultural Center of The University of Arizona, *ca.* 50 km south of Phoenix. Among specific investigations, the petroleum-derived CO_2 (^{14}C- and ^{13}C-depleted) used to enrich the FACE plots in cotton and wheat experiments was used as an isotopic tracer to follow atmospheric carbon into the plants and then into the soils. The early work (Leavitt *et al.* 1994) with cotton indicated an isotopic shift in $\delta^{13}C$ of the FACE