

povka stratum is $13,260 \pm 100$ BP, AA-13392. Charcoal collected without close association with artifacts and located 1 m away from any artifacts was AMS dated to $42,800 \pm 1,900$ 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 $\delta^{13}\text{C}$ of the FACE

soils consistent with *ca.* 10% input of freshly derived carbon during the experiment, whereas TAMS-measured ^{14}C activity produced some inconsistencies which prevented independent confirmation of the 10% input figure. The first few $\delta^{13}\text{C}$ numbers also actually produced initial ambiguous results, but the weight of additional measurements produced a clearer picture. We hypothesized that some combination of lab precision and field variability may have contributed to uncertainty with few initial data points. In this study, soil was sampled from the location of eight new circular plots (23-m-diameter plots embedded in a *ca.* 9 ha farm field) just prior to the beginning of 1995–1996 FACE experiments with wheat. Each plot was sampled with at least four soil cores taken along equally spaced radii from the center and at depths of both 0–30 cm and 30–60 cm; in the case of two of the plots, 8 cores were taken. Soil samples were acidified with 1N HCl to remove soil carbonates, and plant fragments were removed by skimming from the liquid surface and by manual removal from dried, ground soil using forceps under 20 \times magnification. Multiple combustion and analyses of the same soil sample indicate precision of *ca.* 0.3‰. The $\delta^{13}\text{C}$ results on this total organic carbon fraction produced a range of average values among the plots of *ca.* 4‰ for the 0–30 cm depth and *ca.* 1‰ at the 30–60 cm depth. Within plots, the $\delta^{13}\text{C}$ range was as much as 3‰ for both 0–30 cm and 30–60 cm soils, although the standard deviations for the deeper soils were in all cases smaller than for the surface soils. The results indicate substantial variability in the isotopic composition of the soil organic carbon, especially in the surface layer, in spite of the fact this layer has been heavily plowed over several decades of farming. These fields were leveled early in their history, which could account for some of the variability depending upon specific removal and additions of soils to different areas in the field. Our results demonstrate the need for sufficient subsampling to characterize the isotopic composition of this organic carbon pool, and to detect isotopic changes.

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^{14}C BOMB PULSE IN FIRN AND ICE AT LAW DOME, ANTARCTICA

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Air bubbles in high accumulation Antarctic ice cores with unequalled time resolution are being used for the reconstruction of atmospheric concentration and isotopic records of trace gases (CO_2 , CH_4 , N_2O , etc.). Knowledge of the air trapping process which determines the age and age spread of the enclosed air is essential for these reconstructions. In this study, radiocarbon measurements have been used to characterize the trapping process.

The dry extraction technique was used to recover CO_2 from ice samples taken from the DE08 and DE08/2 ice cores from Law Dome, Antarctica. The apparatus is able to process ice samples up to 2 kg in size, and the dry extraction process preserves ice crystals that may contain *in-situ* produced ^{14}C , thus eliminating a possible source of interference with $^{14}\text{CO}_2$ trapped in air bubbles. A fast recovery procedure and nearly closed system approach reduced the overall contamination in the