

First results from the new ^{14}C -AMS Facility (LAC-UFF) at Niterói, Brazil

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Researchers from the Institute of Physics of the Universidade Federal Fluminense (IF-UFF) have been working for more than one decade in collaboration with foreign AMS radiocarbon laboratories such as the Australian National University, the PRIME Lab of Purdue University and the Keck Carbon Cycle Laboratory of the University of California. Multidisciplinary works have been performed in the fields of archaeology, marine biology, paleoclimatology and geosciences. In 2009, the first Brazilian radiocarbon sample preparation laboratory for AMS technique was installed at the IF-UFF. It consists of two separate areas, which are dedicated to chemical treatment and graphitization. A stainless steel based vacuum line using a turbo pump was constructed for carbon dioxide purification. Then, following the advice of Prof. K. Fifield, from ANU, we have applied to the Brazilian Science and Technology Ministry, through its Innovation Agency FINEP, to buy a 250 kV Single Stage Accelerator Mass Spectrometry (SSAMS) system produced by National Electrostatic Corporation. We bought the SSAMS system at the end of 2009, and at February 2012 it has arrived at the IF-UFF to be installed. It took less than one month between the opening of the boxes and getting the first ^{14}C -AMS measurements of unknown samples. The LAC-UFF is the first ^{14}C -AMS Laboratory in Latin America. In this talk we will show some of the first results obtained at LAC-UFF. We have compared measurements performed at our laboratory with those performed at the traditional CENA (Centre for Nuclear Energy in Agriculture of the University of São Paulo), a ^{14}C Laboratory using the benzene liquid scintillation counting system, and with the University of Georgia (UGAMS), Georgia, USA. Replicated pre-treated samples of shells, organic soils, vegetable fragments, charcoal and peats were converted to CO_2 and measured at UFF and CENA. Also, pretreated sediment samples previously converted to CO_2 at CENA were replicated and sent to the ^{14}C AMS Laboratory of CAIS, University of Georgia, and to LAC-UFF for graphitization and measurements. All results from distinct inorganic and organic samples were in very good agreement. Also, at LAC-UFF, the IAEA reference materials C2 (carbonate), C5 (wood) and C6 (sucrose) and calcite blanks were prepared as quality control. Typical currents were $50 \mu\text{A } ^{12}\text{C}^{-1}$ measured at the low energy Faraday cup. The isotopic fractionation is corrected by measuring the $\delta^{13}\text{C}$ on-line in the accelerator. Graphite and calcite blanks yielded average $^{14}\text{C}/^{13}\text{C}$ ratios of 1.3×10^{-12} and 1.1×10^{-12} , respectively. Average machine background was 10^{-13} and average precision was 0.8%. These results indicate that the AMS LAC-UFF presented very good analytical accuracy in this inter-comparison exercise and is ready to start with the routine analysis and also with the research programs, mainly with Brazilian and Latin America groups in several areas of Science, such as Geosciences, Oceanography, Archaeology. As example, we mention the investigation of temporal changes of environmental processes in the Southern Brazilian Bight, for which two 60 cm long sediment cores were collected at 14 meters depth and parameters such as Total Organic Carbon (TOC), nitrogen (N), phosphorus (P), $\delta^{13}\text{C}$, $\delta^{15}\text{N}$ and granulometry were evaluated through the cores. From 15 to 35 cm depth, variations on the studied parameters lead to an alternate influence of sediments from continental and marine sources which might be related to changes in coastal dynamic, probably related to strong storms events and climatic changes. Shell samples were radiocarbon dated and according to the calibration model used these events

lie in the period between 1488 to 1586AD. Observed events can be evidence of severe storms related to enhanced occurrence of cold fronts which could be associated to the period known as the Little Ice Age (LIA). Results from other projects will also be presented.