Environmental Radioactivity with Accelerators*

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The determination of radioactivity in the environment is of interest not only for its protection and of the human being but also for many other purposes as, for instance, the understanding of the environmental dynamics or the dating of some environmental compartments.

The measurement of radioactivity in the environment involves the determination of very low activity concentrations. Thus, Low-Level Counting or Spectrometry techniques are required for its precise determination. However, radiometric methods have technical limitations that make difficult, or impossible in many cases, to afford specific problems. Accelerator Mass Spectrometry (AMS) is an alternative analytical tool that helps to overcome such limitations by the direct measurement of the number of radioactive nuclei in the sample.

Basically, AMS consists of the coupling of a mass spectrometer to an accelerator, usually of tandem type. Compared to radiometric techniques, the reduction of counting times and sample size are the main contribution of AMS to the problem of Environmental Radioactivity. In many cases, AMS is the only option for measuring long-lived radionuclides with reasonable uncertainty. Furthermore, its mass resolution allows AMS the measurement of interesting isotopic ratios that cannot be determined by conventional detectors and which give relevant information on the radionuclide source to the environment.

In this talk a short review will be done on the evolution of AMS applications to the measurement of Environmental Radioactivity and, therefore, its contribution to the understanding of radionuclide behavior in Nature.

Some technical developments will be described and some applications of AMS to specific problems presented. The experience accumulated by the Spanish National Center for Accelerators (CNA), where a 1MV tandem Cockcroft-Walton based AMS system is working almost two decades ago, will help to illustrate the power of AMS as a sensitive analytical tool. This being a perfect example on how a typical Nuclear Technique or Instrumentation can be applied to solve a problem in a different scientific field.

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