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Ultra low-level radionuclide analysis

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The recent developments in ultra low-level radionuclide analyses include in the radiometrics sector availability of large volume HPGe detectors operating in underground laboratories very often with additional anti-cosmic shielding. In the mass spectrometry sector they include applications of Accelerator Mass Spectrometry (AMS), Inductively Coupled Plasma Mass Spectrometry (ICPMS) and Resonance Ionization Mass Spectrometry (RIMS) for analysis of long-lived radionuclides. Coupling of AMS with GC allowed transfer of analyses from bulk samples to compound specific isotope analyses of environmental samples. Very recent developments include a new ultra sensitive laser-based analytical technique, intracavity optical spectroscopy (ICOGS), allowing extremely high sensitivity for detection of tracers ^{14}C , which is competing well with the AMS technique. Another example represents applications of ion trap mass spectrometry for ultra sensitive radionuclide analyses. These developments in both sectors did not only considerably decrease the detection limits for several radionuclides (up to several orders of magnitude), but they also enable to carry out investigations which were not feasible before either because of lack of sensitivity or because they required too large samples. Applications of radiometrics and mass spectrometry techniques in isotope oceanography, specifically on the distribution of ^3H , ^{14}C , ^{90}Sr , ^{129}I , ^{137}Cs , ^{239}Pu and ^{240}Pu in the water column of the Pacific and Indian Oceans are presented and discussed in detail.

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