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Tracking the Fukushima releases: from environmental monitoring to a showcase of CTBT verification

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In the course of the Fukushima nuclear accident large amounts of antropogenic radionuclides relevant to the Comprehensive Nuclear-Test-Ban-Treaty (CTBT) were released and detected globally. Our group participated in the large European monitoring campaign and tracked fission products in various environmental media in Austria. We could show that the intake of environmental I-131 into the thyroids of wild animals can be used for verification of the CTBT. Due to continuous and highly specific accumulation of I-131, its apparent half-life in the thyroid biomonitor exceeds the physical one, thus making I-131 detectable three weeks longer than using conventional CTBT-grade high volume air samplers. This means an increase in sensitivity of almost one order of magnitude compared with conventional systems.

In a second campaign we analysed the large data set of analyses of Japanese foods. Food was regarded as a geographically well localized environmental sample. The objective of this study was to determine the radiocesium activity ratio (Cs-134/137) in foods from each geographic area to possibly identify the radioactive signature of the four different reactors (i.e. four independent sources) in the distinct regions. No clear deviations from the average value (0.98) could be confirmed in the various regions. Hence, the releases from reactor No. 4 (carrying a significantly smaller activity ratio) are assumed to be small when compared with the other three reactor release. The individual radioisotopic signatures of reactors No. 1, 2, and 3 could not be identified in various Japanese regions using the food samples, indicating integral radiocesium contamination from these sources.