

**International Conference on
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SESSION 2: SAMPLING

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The session on "Sampling" consisted of 2 keynote lectures, 7 oral and 3 poster presentations from scientists from industry, universities and government agencies. Results from sampling programs for soils, fresh water and marine environments, and the atmosphere were presented. The session highlighted that scientists appear to be starting to apply ICRU 75 recommendations in their sampling programs. Some examples were provided on the evaluation of sampling uncertainty and the application of statistical sampling designs used worldwide for the determination of natural as well as anthropogenic radionuclides.

ICRU 75 on sampling for radionuclides in the environment provides a guide on statistical sampling strategies for the purpose of environmental radioactivity monitoring and radioecology investigations. In this field, as in all activities applicable to environmental impact assessment, sampling is part of the assessment process. However, uncertainties associated with sampling are rarely taken into account when reporting results. In this session, the importance was emphasized of representative sampling, statistical sampling design and selection of an optimal sampling strategy. To use statistical tools effectively requires a good knowledge of the environmental processes, detailed planning of the sampling campaign, sample number and frequency of sampling. Potential difficulties associated with statistical sampling approaches were highlighted as well.

Various geostatistical tools are available for data evaluation and the difference between spatial variability and sampling uncertainty, which may occur due to loss of material, cross contamination, inexperience of the person taking the sample, the sampling device and the short range variability were pointed out. These tools allow separation of spatial variability from uncertainty arising from sampling. To illustrate the uncertainty associated with sampling, data from a soil sampling reference site in Italy, which is used at the national and international level to carry out proficiency testing exercises on sampling strategies and representativeness, were presented in a couple of talks.

The following main issues and conclusions emerged during this session:

- Similar to the procedures routinely utilized during the measurement process, quality control and quality assurance procedures should also be applied during sampling.
- ICRU75 should be routinely used for the design of an optimal sampling strategy.
- There is some guidance necessary for statistical sampling in 'real life' scenarios, where an operator's interest is merely to demonstrate compliance, but due to

environmental and practical constraints the recommendations from ICRU75 may be difficult to incorporate.

- Research activities on the practicality of statistical tools in situations with environmental or practical constraints are needed. Although scientists may appreciate the validity of statistical sampling approaches, operators and regulators may still argue that the resources are not available for a statistically valid sampling program.
- There is an urgent need for harmonisation of methodologies in sampling, measurement, analysis and reporting of data, so that valid conclusions and comparisons can be made. This is especially important for dose assessments that are needed for radiation protection and regulation. Valid comparison of dose assessments require that all processes from sampling to data reporting are harmonised and standardised internationally.
- International organizations can play a very important role in the efforts to harmonize sampling and measurement methodologies. They can provide recommendations for sampling, possibly under various (but generalised) scenarios.