First Technical Meeting (TM) on Modelling and Data for Radiological Impact Assessments MODARIA

Working Group 7 — Harmonization and intercomparison of models for accidental tritium releases

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Justification

Fukushima Daiichi Status Report
Stress on nuclear energy
IAEA MISSION
MODARIA goals

All models are wrong...
Groningen, 14-16 March 2011
Objectives

• The environmental behaviour of tritium after accidental tritium releases is highly relevant to all nuclear facilities that have a significant tritium inventory. The dynamics of tritium in the terrestrial environment are the result of the complex interaction of a number of processes that are subject to hourly, daily and annual variations. Due to the uncertainties of the environmental conditions at the time of the release, predictions are inherently associated with considerable uncertainties. The work performed in the previous IAEA model testing and comparison programmes improved the understanding of many processes related to tritium washout and transfer in aquatic food chains as well as, to some extent, its transfer in the terrestrial food chain. More work is needed to enable reliable assessments of exposures related to accidental tritium releases taking into account actual weather, environmental and agricultural conditions.
Analysis of the transfer of tritium in terrestrial ecosystems

- Interception of wet deposited tritium by plant canopies and uptake by leaves
- Uptake of tritium by vegetated and non-vegetated soil
- Transfer of tritiated water (HTO) and the dynamics of HTO in the soil–plant–atmosphere complex
- Re-emission of HTO from soil as a secondary source
- Formation of organic bound tritium (OBT) at night
- Oxidation of OBT during preparation and storage of feed and food
- Turnover of OBT in litter and soil
Inter-comparison of models for specific scenarios

- Dry or wet deposition of tritium following dry or wet weather periods
- Dry and wet deposition of tritium during the day and during the night;
- Dry and wet deposition of tritium during different seasons.
Guidance for application of environmental tritium models

- Uncertainty analysis and testing against experimental data;
- Exploring possibilities for model simplification;
- Exploring the need for site-specific data;
- Links to atmospheric transport models;
- Application to fluctuating tritium release
The main objective of this project is to better understand and quantify the transfer processes of tritium from the atmosphere (air and rainwater; tritiated hydrogen (HT)/HTO) to grass and soil.

In order to address the enormous range of factors that affect the transfer of tritium (e.g. humidity in air and soil, temperature, current and recent rainfall, season, stage of growth etc.), the IRSN project will carry out high frequency (daily) sampling in air, rainwater and soil to reduce uncertainties of tritium transfer coefficients.
IRSN investigations: 2013–2017

• Dynamics of formation of OBT in grass, depending on the contribution from the various compartments of the environment involved: air (water vapour), rainwater, soil (water);
• Dynamics of formation of HTO in soil from an atmospheric source of HT;
• Speciation of tritium in air (HT/HTO);
• Quantification of dry deposition of HTO;
• Quantification of wet deposition of HTO.
Results

• Peer reviewed papers on improved modelling aspects and model comparison exercises
• Technical report on the compilation of parameters to quantify environmental transport processes
• Report on the analysis, tests and comparison of models developed for the transfer of tritium in the environment
• Technical report containing guidance for the application of improved and harmonized models for tritium
CAVEAT

The designated work group lieder does NOT know the solutions/answers on any desired task/results for this WORKING GROUP.

It is only stressed by the large uncertainty of actual models for tritium Radiological Impact Assessment and insufficient experimental data for some key aspects.
If I have seen a little further it is by standing on the shoulders of Giants."

Original saying attributed to Bernard of Chartres, 'nos esse quasi nanos, gigantium humeris insidentes."

...we are like dwarfs on the shoulders of giants, so that we can see more than they, and things at a greater distance, not by virtue of any sharpness of sight on our part, or any physical distinction, but because we are carried high and raised up by their giant size.

ESPM 228 Advanced Topics in Biometeorology and Micrometeorology, 2010

From a lecture of Denis Baldocchi, Professor of Biometeorology Ecosystem Science Division, University of California, Berkeley