

EMRAS

**Environmental Modelling for Radiation Safety
Working Group 4 – Model validation for
radionuclide transport in the aquatic system
“Watershed-River” and in estuaries
(IAEA)**

EVANET-HYDRA

**Evaluation and Network of EC-Decision Support
Systems in the field of Hydrological Dispersion
Models and of Aquatic radioecological Research
(EC)**

Joint meeting

5-7 May 2004, IAEA, Vienna International
Centre, Vienna, Austria

MINUTES OF THE MEETING

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MINUTES OF THE MEETING

A joint meeting “EMRAS/EVANET-HYDRA” (the 9th “meeting” of the network EVANET-HYDRA) was held in Vienna (Austria) and was hosted by the IAEA (International Atomic Energy Agency).

As expressed by the participants in the previous 3rd co-ordination EVANET-HYDRA meeting in UK, a joint meeting EVANET-HYDRA / EMRAS (5-7 May, 2004) was considered of interest for the achievement of the aims of the network.

EMRAS (Environmental Modelling for Radiation Safety) was launched by the IAEA in 2003. EMRAS continues some of the work of previous international programmes in the field of radioecological modelling (VAMP, BIOMASS, etc). Among the six working group established, the Working Group 4 – Model validation for radionuclide transport in the aquatic system “Watershed-River” and in estuaries is of particular interest for a fruitful co-operation EMRAS/ EVANET-HYDRA. Several participants in the EMRAS programme are members of the EVANET-HYDRA network.

The objectives and aims of the meeting were:

- To disseminate and discuss the results from recent achievements of EVANET-HYDRA;
- To discuss the results of an exercise of validation of models for predicting the contamination of river water following the flooding of heavily contaminated areas in the catchment of River Prypiat carried out in the frame of EMRAS WG 4;
- To present further scenarios for model validations;
- To plan future activities of EMRAS WG 4 and of EVANET-HYDRA network in view of a possible harmonisation between these two projects.

After the welcome address from D. Louvat of IAEA and the introduction of the participants in the meeting, the aims and achievements EVANET-HYDRA were presented. The assessment of the state of the art of lake, catchment and river models was finalised. The results are available as a technical report delivered to the EC and 3 papers for the scientific literature, 2 of which have been published for dissemination to a broad public (Monte, L. Brittain, J. E., Håkanson, L., Smith, J. T., van der Perk, M. (2004). *Review and assessment of models used to predict the migration of radionuclides from catchments. Journal of Environmental radioactivity* 75:83-103; Monte, L. Brittain, J. E., Håkanson, L., Heling, R., Smith, J. T., Zheleznyak, M. (2003). *Review and assessment of models used to predict the fate of radionuclides in lakes. Journal of Environmental radioactivity* 69:177-205). A third paper concerning the state-of-the-art of models for predicting the behaviour of radioactive substances in river ecosystems has been submitted to a scientific journal. Information concerning the achievement of EVANET-HYDRA are available on the web-site <http://info.casaccia.enea.it/evanet-hydra>. It was proposed to link this site with the IAEA's EMRAS project site (<http://www-rasanet.iaea.org/projects/emras/emras.asp>).

Preliminary results of certain models used to predict the behaviour of radionuclides in the Chernobyl floodplain were presented by R. Perianez, Universidad de Sevilla (Spain), D. Hofman, Studsvik&RadWaste AB and L. Monte, ENEA. Practical demonstrations of these models were supplied. Studsvik&RadWaste AB described the main features of the Computerised Decision Support System MOIRA and how it was applied to address the specific scenario. The Universidad de Sevilla presented the results of a sensitivity analysis of the model for the floodplain scenario. The preliminary results were considered encouraging in relation to the good performances of the models for predicting the behaviour of ^{90}Sr in the river water. Further discussions will be necessary to finalise the exercise for ^{137}Cs .

The following scenarios for further validation exercises of models and Decision Support Systems were presented:

2. Radionuclide migration through the River Techa (Ivan and Alexander Kryshev)
3. Tritium migration through the Loire River (Marilyne Luck and Nicole Goutal)
4. Radionuclide migration through a coastal/marine environment – Dneiper estuary, Black Sea (Mark Zheleznyak).

The descriptions of the models for the floodplain scenario, the relevant preliminary results and the description of the scenarios A, B and C will be available as a draft document restricted to the project participants before the next EMRAS plenary meeting.

A draft of the chapter “Freshwater ecosystems” to be included in the revised version of IAEA TRS 364 “Handbook of Parameter Values for the Prediction of Radionuclide transfer in Temperate Environments” was prepared. The document is based on the recent achievements of the assessment carried out in the frame of EVANET-HYDRA. The draft will be distributed as soon as possible to the other participants of the EMRAS Working group 4 for additions, revision and improvements.

The joint meeting made a significant contribution towards achievement of the aims of both projects, especially in relation to the activities that will be carried out during this final year of EVANET-HYDRA (coastal and marine model assessment). Indeed, it made possible a close co-operation with researchers that are not directly involved in the EVANET-HYDRA network.

Work plans

EMRAS Working Group on Model Validation for Radionuclide Transport in the Aquatic Systems: Watershed-Rivers-Estuaries

Scenario 1 – Floodplain (Chernobyl), prepared by Mark Zheleznyak – participating modellers (model): Raul Perianez, Luigi Monte (EMRAS *ad hoc* model), Dmitry Hofman (MOIRA)

- Results of model validation for first part of scenario (flood caused by an ice jam in January 1991) presented at the meeting will be included in WG progress report

- Calculations for first part of scenario (flood caused by an ice jam in January 1991) will be carried out again to take account of discussion and new information presented (data on experimental determination of k_{ds} ; duration of flooding event of only 10 days (21 January to 1 February 1991), soil profiles to determine depth of contaminated sediment layer); calculation to be finalised by EMRAS's Second Combined Meeting; Mark Zheleznyak to provide modellers with activity concentrations of Cs-137 measured at outlet; results of new calculations to be sent to Luigi Monte as Excel files by mid-October 2004.

- Calculations for second part of scenario (spring flood in April 1994) will be delayed until after second Combined Meeting. Details of this part of scenario to be discussed at Second Combined meeting. Mark Zheleznyak to prepare first draft of scenario and circulate before the second Combined Meeting of EMRAS in October 2004.

Scenario 2 – Contamination of Techa river, prepared by Ivan Kryshev and Alexander Kryshev – participating modellers (model): Geert Olyslaegers (SCK), Rudie Heling (RODOS users), Patrick Boyer (CASTEAUR), Dmitry Hofman/Luigi Monte (MOIRA)

- Description of Cs-137, Sr-90 scenario to be finalised by Ivan Kryshev by mid June. Note that emphasis should be on the disclosure of new data since the CARAT project. Interest for this part should be on long term releases

- Scenario for Pu and other radionuclides (Zr, Nb, Ce) to be finalised by I Kryshev by mid-July. In this case the important issue is whether it will be possible to estimate influx from Assanov swamps into the Techa River

- Information to be provided by Ivan Kryshev should include activity concentrations measured in the Techa River (test will not be blind). Results of this exercise will be discussed at the second Combined Meeting of EMRAS.

Scenario 3 – Tritium in the Loire river, prepared by Marilyn Luck and Nicole Goutal – participating modellers (model): Rudie Heling (RODOS users), Mark Zheleznyak (RODOS developers), Patrick Boyer (CASTEAUR), Dmitry Hofman/Luigi Monte (MOIRA), Marilyn Luck and Nicole Goutal (MASCARET)

- Scenario to be finalised by end of July 2004. Scenario will be sent to participating modellers and IAEA with a confidentiality agreement not to disclose data (data from DIREN). Details of scenario must not be made available on the EMRAS's web site.

- Results of calculations should be sent back to Nicole Goutal by the end of September 2004. Results should be sent in an ASCII file whose format will be communicated by Nicole Goutal.

- Analysis of results will be carried out by Nicole Goutal and discussed at the second Combined Meeting of EMRAS.

Scenario 4 – Estuary of the Dniepr River contaminated with Sr-90 and Cs-137 of Chernobyl origin, prepared by Mark Zheleznyak – participating modellers (model): to be decided,

- Scenario still in preliminary stages. The scenario will be discussed further at the next meeting of the EVANET-HYDRA project (Poland). Mark Zheleznyak would like to receive comments on the material presented at the WG meeting to help him prepare the scenario. In particular Mark would like to receive information on data required by models (for example details of compartments for compartmental models)

- Calculations will be delayed until after second Combined Meeting. Mark Zheleznyak should prepare a first draft of Scenario to be discussed at the Second Combined Meeting.

Other Activities

- Input to TRS 364 Working Group: John Brittain is coordinator for this activity. This is an on-going activity. Participants to WG on Watershed should send contributions to John Brittain. Reminders will be sent to WG participants at regular intervals

- Lars Hakanson has been given the task to make a presentation at the second Combined Meeting on the evaluation of health effects on humans and impact on ecosystems in the Techa River catchment area associated with the releases of radioactive effluents into the river. This presentation will be based on a review of papers available on the subject and it is subject to Lars Hakanson's participation in the meeting.

EVANET-HYDRA

The topical meeting in Poland (7-9 June, 2004) will focus on the following issues:

- i) Principles for developing models to predict the behaviour of radionuclides in coastal areas;
- ii) Presentation of models for predicting the behaviour of radionuclides in coastal areas and marine environment
 - (1) RODOS THREETOX
 - (2) POSEIDON
- iii) Presentation and discussion of a the final version of the scenario relevant to the radionuclide contamination of the estuary of river Dnieper;
- iv) RODOS End users' progresses.

NRG (The Netherlands) will prepare and send to ENEA the report on the activities of the topical meeting in Bucharest (Comparative application, demonstration and exercise of models and Decision Support systems – river ecosystems).