NERIS and hydrological pathways – setting the scene

Wolfgang Raskob

On behalf of the NERIS Platform

ALLIANCE-NERIS workshop

March 28-28, 2018

NERIS Interest

- Chernobyl and Fukushima have demonstrated that the aquatic pathways are of importance for emergency management and rehabilitation
- In particular drinking water and aquatic foodstuffs are of concern for the public
  - Flooding events after snow melt were identified as high risk scenarios for Kiev
  - Management of reservoirs were identified as one possible countermeasure to reduce contamination of water bodies used for drinking water production
  - Fish consumption in the area of Fukushima was stopped
- Following Chernobyl, hydrological models in the JRodos Decision support system were introduced and a European handbook for the management of drinking water was developed
- Following Fukushima, research on the aquatic models was intensified, in particular related to the marine foodchain

Status

- Operational models in the HDM of JRODOS with run-off, 1-D, 2D and 3-D transport models, compartment models with foodchain, catchment models (MOIRA) with countermeasure options – presentation later on
- Operational models in various countries (e.g. France)
- Research models for different areas, improved in the frame of the COMET project
- Handbook on drinking water
- What is missing
  - Coupling of operational hydrological flow models as boundary conditions for the radionuclide dispersion models – as in atmospheric dispersion
  - Countermeasure simulation in most of the transport models
  - How to deal with hundreds of lakes and reservoirs in one country used for drinking water – do they need all individual models?
  - Strategies to manage large scale contamination in areas where drinking water and irrigation water is produced – short and long-term
  - Improved models for particular applications (e.g. urban, run-off, marine)

Observations dispersion

- Meteorological forecast models provide information on the flow in the atmosphere
- Hydrological models still try to forecast the movement of water in rivers, reservoirs and ocean instead of using existing operational models
  - First attempt is to use the MyOcean modelling system (http://marine.copernicus.eu/)
- Understanding of processes in terrestrial environment is well advanced
- Understanding of processes in aquatic environment is still limited to key radionuclides
- Data assimilation approaches and uncertainty estimation is part of atmospheric dispersion modelling, but hardly part of aquatic models for transport of radionuclides

Observations countermeasures

- Development of terrestrial countermeasure strategies is well supported by handbooks and simulation models for inhabited areas and food production systems
- For aquatics, a handbook exists covering measures for drinking water and simulation models (static) for individual countermeasures in lakes, rivers and catchments (e.g. MOIRA)
- Simulation of physical countermeasures such as the construction of a dike is hardly realised and difficult to judge if appropriately simulated
- Countermeasure modelling covers all radionuclides, whereas in aquatics, often only main radionuclides are considered (e.g. Sr and Cs), except in the handbook
- How to manage drinking water when you have thousands of suppliers in one country and hardly a clear view on the temporal behaviour of the contamination in all areas where drinking water is collected
  - Consequence: only manipulate during the preparation process?

Possibilities

- Develop a countermeasure simulation model that at least contain all options described in the handbook – or more as example table for lakes

Chemical	Decontamination				Other
Potash Treatment	Physical	Physio-Chemical	Chemical	Biological	Social
Direct Liming	Flood dykes	Removal of sediments	Adsorption dykes	Fishing (removal of biomass)	Food preparation
Fertilisation	Decontamination of urban runoff	Removal of snow and ice	Treatment of drinking water	Fish removal (poisoning)	Bans: Fishery produce Drinking water Irrigation water
Wetland liming	Control of water flow				Alternative drinking water source
					Dietary Changes

Possibilities cont.

- Improve the understanding of processes and pathways, in particular foodweb and number of radionuclides – together with ALLIANCE
- Is there a good way to model surface run-off for a larger catchment in a dynamic way?
- Better coupling of radionuclide modelling to operational transport and dispersion models of national and international hydrological services
- Analyse the countermeasures applied in Japan and identify areas for improvement taking into account economic and societal considerations
- Analyse countermeasure strategies for drinking water at different levels (local to national) and not just on the process level as was done for the handbook
- How to optimise countermeasures using hydrological models?

- 25-27 April 2018, Dublin Castle (Ireland)

Thank you for your attention

www.eu-neris.net