WG10 – Modelling of marine dispersion and transfer of radionuclides accidentally released from land-based facilities

MODARIA

IAEA
International Atomic Energy Agency
Participants

• 15 participants in WG10 meeting
• Represented countries: Brasil, Rep. Of Korea, Thailand, Norway, Greece, Spain, Japan, France, Iran, Netherlands, Ukraine, Sweden
• Productive meeting: useful discussions, decisions taken
Scenarios

1) Fukushima releases in the Pacific Ocean
   - Intercomparison of hydrodynamic submodels
   - First simple dispersion exercise
   - Generation of input data for WG8 biota dynamic modelling exercise

2) The Baltic Sea: modelling Chernobyl fallout
   - Scenario description potentially finished: distributed on June 6th, 2013
   - First modelling results have been discussed
Fukushima scenario

• Presentations on
  - Intercomparison of model calculated SST with satellite data
  - Model descriptions and results for simple dispersion exercise by:
    • KAERI
    • JAEA
    • IMMSP
    • University of Seville
    • SisBahia (Brasil)
    • IRSN
  - Joint results for the exercise
SST data for the first week of April and first simple dispersion exercise

JCOPE2 hydrodynamic model selected for phase 2 of the exercise
Phase 2 of the exercise

- JCOPE2 water circulation
- Constant (arbitrary value) release
  - a) perfectly conservative radionuclide
  - b) 137-Cs (interacting with sediments)
- Endpoints
  - Time series of concentrations in water and sediments
  - Concentration maps at the end of the simulation
- Results for next interim meeting
- Future: realistic source term
Meeting with WG8, Wednesday afternoon

- Presentation on how input data required by WG8 biota dynamic exercise:
  - Time series of 137-Cs, 131-I and 90-Sr concentrations in surface water, deep water and bed sediments at selected locations
  - Models providing data
    - KAERI (137-Cs)
    - JAEA (131-I)
    - University of Seville (90-Sr)
- Presentations by WG8 on calculation results
Baltic Sea scenario

- First exercise description distributed in June 2013
- Results presented by
  - NRPA (box model)
  - IMMSP (3D model, box model)
  - University of Seville (2D model)
Modelling endpoints

5 year of calculation from October 31, 1986

- Maps of $^{137}$Cs concentration in surface water and sediments in October 31, 1991
- Time series of $^{137}$Cs inventories in the water column and bed sediments
- Time series of concentrations in water and sediments at selected locations
THREETOX modeling system

Free-surface, primitive equation model;
*k-epsilon* model of turbulence
Ice dynamic-thermodynamic model
Orthogonal curvilinear system coordinates
Mixed vertical coordinates
Wetting-and-drying algorithm
Heat exchange with bottom
Two-way nesting
Near field sub-models
Eulerian models of sediment transport
Eulerian models of radionuclide transport
The Baltic Sea scenario: Baltic Sea compartments

Fig 1. Scheme of Baltic Sea boxes connected to North-Atlantic boxes. R – Ringhals, B – Barseback, O – Oskarshamn, F – Forsmark, S – Studsvik. Blue are two-layer boxes.
Example of results: 2D model
Next phase

Radioactivity in the Baltic Sea, 1999-2006
HELCOM thematic assessment

Helsinki Commission
Baltic Marine Environment Protection Commission
Next meeting

- Monaco IAEA-MEL
- June, 3 to 5