INTERCOMPARISON OF MODEL CALCULATION OF THE TURNOVER OF 
Ra–226 WITHIN AN AQUATIC ECOSYSTEM

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ABSTRACT

Within the international BIOMOVS project a broad comparison and 
testing of assessment models is undertaken for different release and 
dispersion scenarios.

One of these scenarios dealt with the turnover of Ra–226 and Th–266 
in a lake ecosystem. This ecosystem is continuously contaminated by in– 
flow from a river over a period of 100 years with a concentration of 
1 Bq/l of each nuclide.

This paper discusses the results from seven models which have been 
used to calculate results for Ra–226. Best estimates and associated un– 
certainties of the concentration in fish, sediment and drinking water are 
compared as well as major contributions to the uncertainties. The reasons 
for discrepancies between the results from the different models are sum– 
marized. Some recommendations on how to improve the confidence in results 
and reduce the uncertainty are given.

INTRODUCTION

Mathematical models are extensively used to evaluate the potential 
environmental impact of releases of radionuclides. Because models can 
only approximate real world conditions, the predictions are associated 
with uncertainty.

To ensure confidence in model-based decisions the uncertainty in 
the predictions must be estimated and if necessary reduced. To be able 
to do so a variety of tests should be carried out. These tests involve 
the comparison of model predictions with independent data sets over a
range of environmental conditions as well as intercomparisons of the predictions made by different models. An international project, BIOMOVS (BIospheric MOdel Validations Study) has been initiated to address the issue of model testing /1/.

The primary objectives of BIOMOVS can briefly be described as follows:
1. to test the accuracy of the predictions
2. to explain differences
3. to recommend priorities

Two different approaches are used to fulfil these objectives. One approach uses independent data sets for formulation of test scenarios while the other uses specific test scenarios selected on the basis of priorities.

One of these scenarios treats the behaviour of radium-226 and thorium-230 released to a lake from a river. This paper is a brief summary of the results obtained for radium /2/. In addition some recommendations are given for improving data and models.

SCENARIO DESCRIPTION

The test scenario is described as follows: given an average concentration of Ra-226 (1 Bq/l) in a river over a period of 100 years, a) calculate the concentration (Bq/m$^3$) at times 1, 10, 50 and 100 years in the sediment of the lake, and b) calculate the concentration at times 1, 10, 50 and 100 years in the edible tissues of fresh water fish (in Bq/kg fresh wt) and in drinking water prior to human consumption.

Assume a suspended sediment load of 50 g/m$^3$, a sedimentation rate of 1 cm/y, an average discharge of water from the lake of 300 m$^3$/s with a turnover rate of the water of once per year, and that after a period of 100 years the lake has not yet been filled with sediment.

The scenario was deliberately described in general terms to ensure the participants to consider all factors influencing the results.

The best estimate prediction was requested as well as minimum and maximum values (corresponding to a 95 % confidence interval). The participants were also requested to identify the major source of the uncertainty in their results.