Technetium-99 in the Nordic Seas and the Arctic Ocean 1970 – 2002: observations and model results

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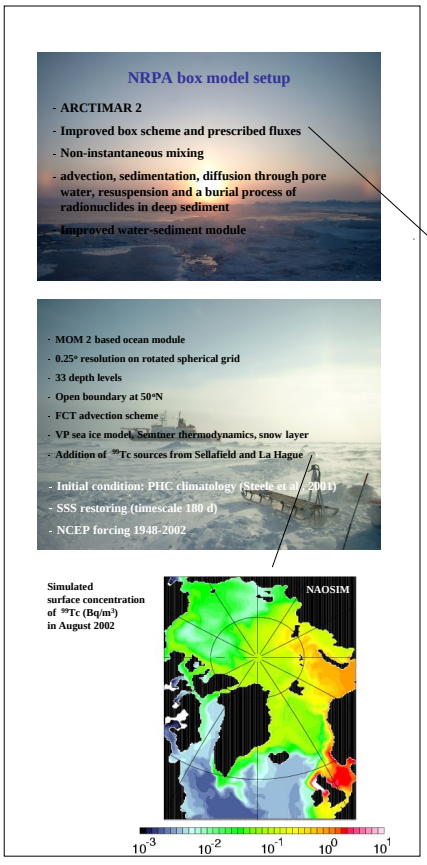
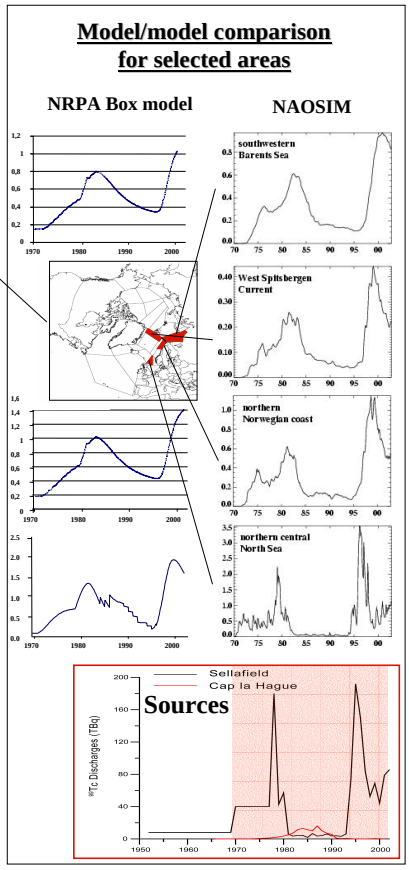
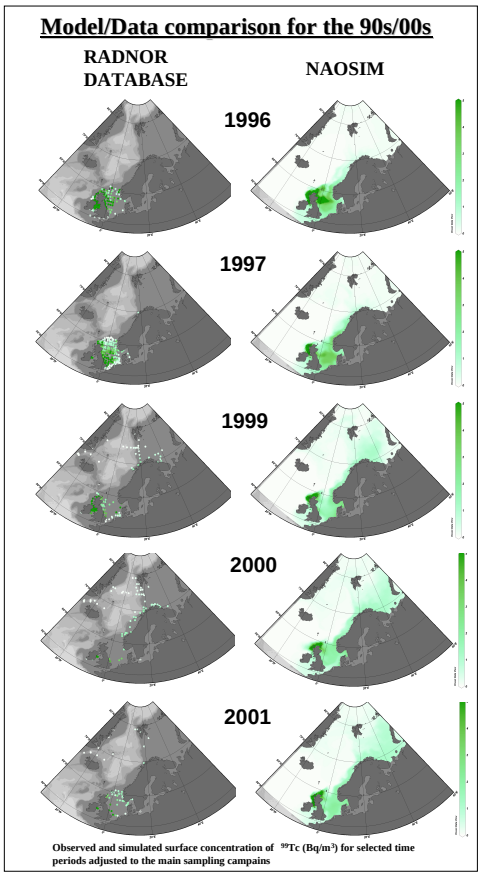
Technetium-99 (^{99}Tc) is a highly soluble, beta emitting anthropogenic radionuclid e with a half -life of 213000 years. The primary source of ^{99}Tc to the northern marine environment has been through controlled discharges from the nucl ear reprocessing facilities at Sellafield (UK) and Cap la Hague (France) which have taken place over several decades and have seen two periods of heightened discharg e in the 1970's and the 1990's. In the Nordic Seas, ^{99}Tc is detected along the Norwegian Coastal Current (NCC) and further north, in the Barents Sea and West Spitsbergen Current. The further pathways of ^{99}Tc are a recirculation with the East Greenland Current in the No rdic Seas and an intrusion into the Arctic Ocean proper with advective timescales of up to several decades.

In the Norwegian Research Council (NFR) funded research project **RADNOR**, two state -of-the-art numerical models are used to simulate the fate of ^{99}Tc discharges into the marine environment: The hydrodynamic coupled ice -ocean model **NAOSIM**, forced with realistic atmospheric data and the **NRPA assessment box model** which is forced by a fixed circulation pattern, but resolves the movement of the radionuclides in several environmental compartments.

We present results from the present state of analysis of the NAOSIM and NRPA model simulations of the dispersal of ^{99}Tc and a comparison of the model simulations with an observational database. The database has been put together fr om existing measurements starting in 1984 and is regularly updat ed by data from recent cruises. The sampling strategy for the modern cruises is already developed on the basis of RADNOR results. The project will help to provide a better understanding of the dispersion dynamics of ^{99}Tc in the Nordic Seas and the Arctic Ocean, improve assessment m odelling with box models and support monitoring design. The hydr odynamical modelling will benefit from a thorough validation process with the observed tracer data.







RESULTS:

- **Preliminary model/data comparison shows large similarity – high variability on monthly scale and patchy datacoverage in ti me requires caution in comparison and in data interpretation**
- **First model/model intercomparison with current box model version is satisfying, though further improvement of flux -scheme seems necessary and is planned**
- **In addtion an analysis of flow structure variability from NAOSIM will provide box model flux schemes for several different circu lation states to better cover flow variability on decadal timesc ales**

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