Preface

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Sediment is generally a sink for pollutants. With the wastewater from nuclear facilities radioactive substances enter the sea water and are either bound to suspended particulate matter, which settles by and by, or adsorbed directly to sea sediment. The sorption tendency of the marine sediment strongly depends on its condition. For example, the mainly sandy surface sediments of the North Sea tend to have a weak sorption of radioactive substances, whereas the clay-containing marine sediments in the Baltic Sea tend to have a stronger adsorption. The adsorbed radioactive substances are generally trivalent radionuclides and radionuclides of higher valency as well as cobalt and zinc isotopes.

By natural events such as storms or bioturbation, as well as by anthropogenic activities such as bottom trawling and beam trawling, radionuclides adsorbed to sea sediment can again enter the seawater column. This happens either via resuspension or via desorption. In the resuspension radioactive substances bound to particles from the sea sediment are whirled up, which are thus again to be found as marine suspended particulate matter in seawater; during desorption, the radioactive substances from the sea sediment are directly released back into the seawater.

The majority of the contamination of the marine sediment in the German Bight is caused by radionuclides, which are released due to resuspension or desorption of the sea sediment of the Irish Sea – this sediment was particularly highly contaminated in the 1970s – and transported to the German Bight. These are mostly the artificial radionuclides Cs-137 and the transuranic elements Pu-238, Pu-(239+240), Pu-241 and Am-241. The sediments of the Baltic Sea were mainly contaminated as a consequence of the Chernobyl reactor accident, whereby this contamination took place regionally differently. In general, the specific activity of the marine sediment is dominated by natural radionuclides such as K-40 and the radionuclides of the uranium, radium and thorium decay series.

Gamma spectrometry is primarily used for monitoring of marine sediments and suspended particulate matter since it allows the easiest and fastest statements about radionuclide contents in comparison to other measuring methods. If specific activities of transuranic elements have to be determined, more time-consuming, radiochemical procedures with subsequent alpha spectrometry are required.

The radiation exposure to humans caused by radionuclides bound to the marine sediment is extremely low due to the shielding characteristics of the overlying seawater column, but in the tidal area, e.g. on dry fallen beaches, it may turn out higher.