Environment Agency

Evidence

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Survey of gamma dose rates in air around the Esk Estuary related to radioactivity levels in sediments

Project summary SC060083/S3

In 2007, scientists from the University of Liverpool and the Environment Agency completed a survey of sediments in the Esk Estuary to identify whether the doses to the public from gamma radiation had decreased since the last survey, which was undertaken in 1989.

Over the past 30 years the Sellafield site has reduced the amount of radioactivity it releases, and radionuclide activity concentrations in the surrounding environment have also decreased. However, this trend has not been seen clearly in the nearby Esk Estuary.

In the 2007 survey, to address concerns about the Esk Estuary, we measured gamma dose rates and collected samples for laboratory analysis. The samples were analysed for seven radionuclides (four naturally-occurring and three anthropogenic) and for particle size distribution.

We compared our 2007 measurements with those from a survey done on behalf of the Department of the Environment in 1989. The mean total dose rate calculated across the whole estuary had decreased from 0.23 microGrays per hour in 1989 to 0.12 microGrays per hour in 2007. Analysis of the data showed that the decrease was statistically significant.

Using the highest measured gamma dose rate we estimated the worst-case exposure rate that a member of the public could receive from the Esk Estuary to be 0.2 microSieverts per hour. For this exposure to exceed the annual dose limit of 1 milliSievert per year, the member of the public would have to spend over 5,000 hours in the Estuary per year. As the highest occupancy is estimated to be 424 hours per year, it is very unlikely that exposure to sediments in the Esk Estuary will cause the annual dose limit to be exceeded.

The results of the sediment analysis showed the highest concentration of anthropogenic radionuclides was below the ground surface. This indicates that the contaminated sediments are being buried by clean sediments supplied by tidal processes.

Additionally, the input of anthropogenic radionuclides to the estuary must have decreased over recent years.

While the 1989 survey found that the highest concentration of radionuclides tended to be in finer grained sediments like silts, this correlation was not seen in the 2007 data.

In summary, the reduction in measured dose rates from the Esk Estuary between 1989 and 2007 can be explained by a combination of reductions in the amount of radioactivity discharged from the Sellafield site, contaminated sediments being buried by tidal processes, and radioactive decay.

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