Short term Prediction of Atmospheric Dispersion of Radionuclides. A case study of a Hypothetical Accident in the Transportation of Uranium from Kayelekera Mine in Malawi

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Abstract

This is a contextual study on nuclear transport safety which considers the risks on human health as a result of the emissions from radioactive materials due to hypothetical uranium transportation accident in Malawi. HotSpot health physics computer code was used for radiological safety assessment and atmospheric dispersion modelling considering the site specification meteorological conditions along the uranium transportation route in Malawi. Three densely populated sites along the route were assumed as release points (named A, B, C). Total effective dose equivalent, committed effective dose equivalent and ground deposition were calculated. At a distance of 10 m at point A, a maximum value of ground deposition of 0.8E+01 Bq/m^2 was observed, followed by 0.5E+01 Bq/m^2 and 0.41E+01 Bq/m^2 at points B and C with distances of 15 m and 13 m respectively for time interval of 1 minute. Maximum total effective dose equivalents were 0.0003 mSv, 0.0028 mSv and 0.0025 mSv at the three points respectively, which are far below the public dose limit of 1 mSv/year as stated by the ICRP and IAEA safety report series. Increased downwind distance decreased total effective dose equivalent. It was concluded that during this hypothetical uranium transportation accident in Malawi, required safety measures to protect the public and environment should always be enforced. The residents along this uranium transportation route should be safe under such a transportation accident.

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