Dose calculations for aviation using atmospheric transport modelling and radioprotection tools

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The EUNADICS-AV project (http://www.eunadics.eu/) aims at filling in the gap between data and decision making by providing comprehensive information to decision makers in the aviation domain. Several types of hazards and events are considered, among them nuclear accidents or nuclear explosions. Unlike with volcanic airborne emissions, little to no information is accessible to aviation when a nuclear event occurs, especially the distribution of radionuclides at cruising altitudes shortly after the event started. In order to understand how the information should be provided and what information is actually significant, an initial study concerning dose calculations to passengers and aircrew inside generic airplanes has been performed. In this study, calculations done with the Lagrangian particle dispersion model FLEXPART version 10 have been used for the Fukushima accident to infer the concentrations of radionuclides an airplane would encounter, both near the airport and at cruising altitude. Several scenarios were run with varying lengths of flights and different times spent inside the dispersion cloud. Using generic geometries from the plane cabin and passengers, two different codes have been used to estimate the corresponding doses. The results show that, even when taking a conservative approach, doses received are of no concern. However, since provision of information is crucial, the ALARA (As Low As Reasonably Achievable) criteria should be followed, and contamination of airplanes should be minimised, a twofold pragmatic solution has been designed. On one side, the doses are inferred from the activity concentrations in air modelled by FLEXPART through look-up tables and using the generic calculations described above. On the other, it could be beneficial that gamma spectrometric monitors are installed in aircrafts.