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Deposition and dispersion of radio-cesium: sensitivity to meteorological models and aerosol properties

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A great number of atmospheric simulations have been conducted to understand the consequences of FDNPP accident. We came to know wet deposition is important but don't know to what extent. We know simulations vary but we don't know why. Meteorological model comparison with a single dispersion model was conducted to evaluate the magnitude of uncertainty in meteorological simulations. Among the deposition processes, rainout by liquid precipitation was the most important process. The fog deposition was the next, which was not considered in any other models but Katata et al., ACP (2015) and this study. Fog deposition is the main cause for the deposition in Gunma and Tochigi prefecture. All the simulation underestimated the airborne observation of Cs deposition, which amounted to 2.6 PBq. The underestimation is approximately 1.5 PBq (1 PBq in Hamadori and 0.4 PBq in Nakadori). It is due to underestimation of deposition process, which is the main finding of the meteorological model ensemble study: Some model overestimated while others underestimated both the precipitation and surface concentration, and therefore the precipitation and source term estimation should be reasonable and not be the cause of underestimation. By considering the A-type (Adachi et al., Sci. Rep., 2014) and S-type (Satou et al., Anthropocene, 2016) of Cs-ball particles, associated with the SRV opening of Unit 2 and Hydrogen explosion of Unit 1, respectively, the underestimation of simulated Cs deposition could be significantly improved. The maximum estimation of the additional deposition due to Cs-ball amounted approximately 1 PBq.