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Model Intercomparison study for atmospheric 137Cs from the Fukushima Daiichi Nuclear Power Plant Accident using identical input data

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An intercomparison of atmospheric dispersion model targeting on the physical process of radionuclides (i.e. 137Cs) released from Fukushima Daiichi Nuclear Power Plant (FDNPP) on March 2011 was conducted. Twelve atmospheric models, which include both the Langrangian-based (dispersed) models and the Eulerian-based models, participated in this model intercomparison project (MIP). To exclude the uncertainties of the model result originated from the emission inventory and the meteorological data, all models used the same emission inventory of 137Cs (Katata et al. 2015) and the same meteorological data with fine spatiotemporal resolution (3 km horizontal grid resolution and 10 min interval), which was created by the Japanese operational weather forecast model coupled with the data assimilation system (Sekiyama et al. 2015). In-situ measurements obtained from the operational aerosol sampling of the national suspended particle matter (SPM) network (Oura et al. 2015) and from the deposition density of radionuclides by the aircraft (MEXT, 2011) were used for the comparison between results of the model and those of the observation. Our analyses elucidated that the figure of merit in space (FMS) of the model ensemble mean about the accumulated deposition of 137Cs was improved from a previous model intercomparson of FDNPP (Science Council of Japan, 2014), in which each model used the different emission inventory and meteorological data. The model ensemble mean captured approximately 36% of the high concentration of atmospheric 137Cs observed at SPM sites during March of 2011. The inter-model spread of the capture rate was from 8 % to 38%. It was originated from the difference in the wet deposition, dry deposition, and the magnitude of diffusion among the models.