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Supplement of

Reassessment of the radiocesium resuspension flux from contaminated ground surfaces in eastern Japan

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Section S1

The geographical features and important locations in Fukushima Prefecture are illustrated in Fig. S1 using Google Earth.

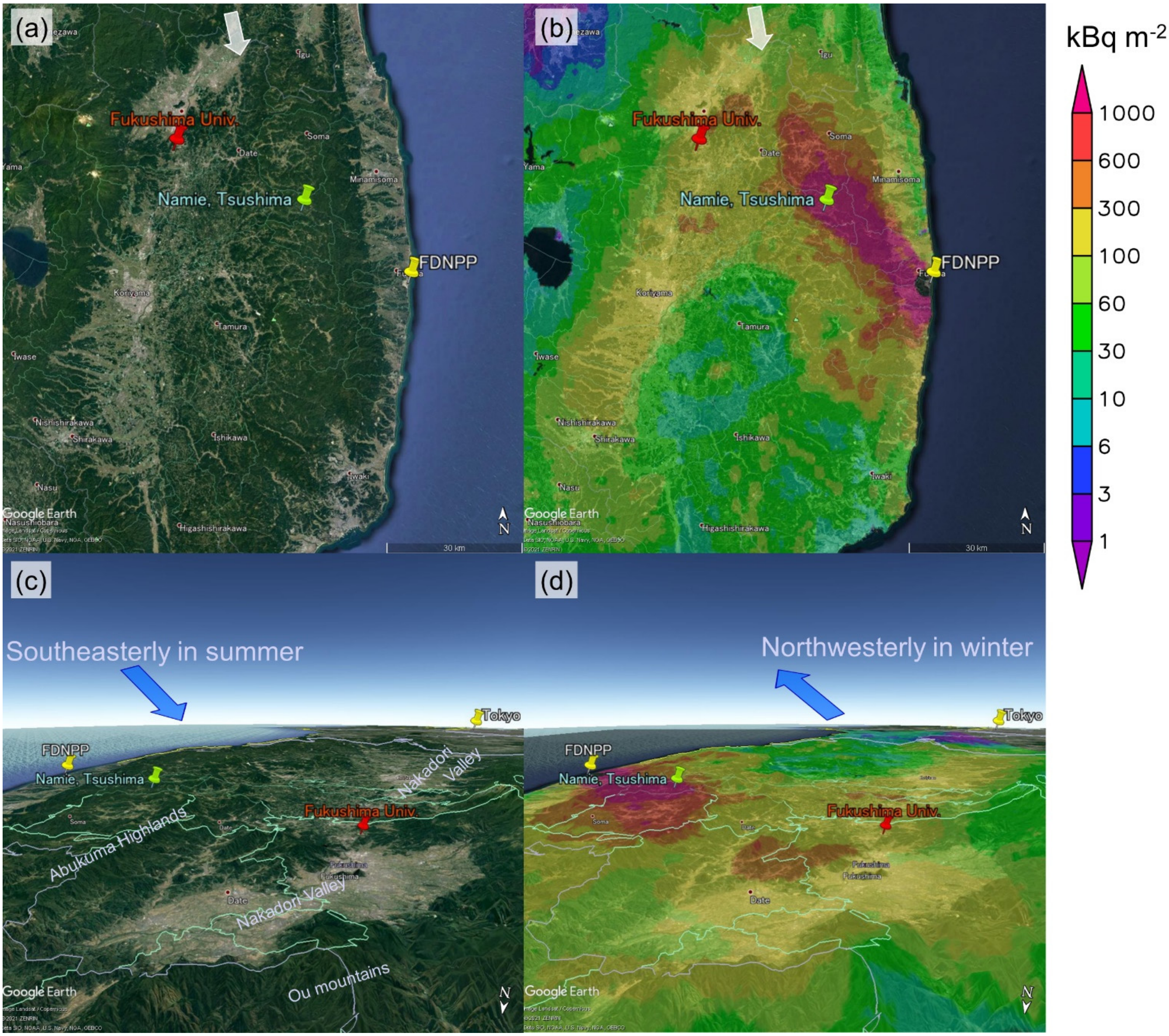

Figure S1. Geographical features and locations of Fukushima University, the Namie (Tsushima) site, and the Fukushima Daiichi Nuclear Power Plant (F1NPP) illustrated by Google Earth (left) without and (right) with aircraft-observed initial ^{137}Cs deposition amounts. White arrows at the top center of (**a**) and (**b**) indicate the directions of the bird's eye views of (**c**) and (**d**). The dominant wind directions, southeasterly in summer and northwesterly in winter, are depicted with blue arrows in (**c**) and (**d**), respectively.

Section S2

Deviations of the 1-D Lagrangian convection model developed in the current study from the original 1-D Eulerian model of Emanuel and Zivkovic-Rothman (1999) are presented in this section. Fig. S2 shows (a, c, e) the measured vertical profiles of unstable atmospheric conditions by radiosonde at Tsukuba (Fig. 1a) and (b, d, e) simulated mixing ratios of tracers driven by the measured atmospheric profiles at three hours after the initial time. In the initial condition, mixing ratios of tracers are zero except for the lowest grid, 100 g kg^{-1}. Warm humid air masses were transported associated with typhoons in (a, b) September 18, 2006 and (c, d) August 14, 2019 and a stagnant Baiu front existed in (e, f) June 19, 2020, which transported the tracers in the surface layer up to 500 hPa, 700 hPa, and 850 hPa, respectively. The Lagrangian model generally captured the tracer profiles simulated by the original Eulerian model, but the accuracy depends on the numbers of Lagrangian particles (LPs). Errors of mixing ratios simulated by the Lagrangian simulations to the Eulerian simulations at the maximum mixing ratio levels in the three events are 4.0–61%, 0.09–2.8%, 0.13–2.9%, 0.04–2.64% for LPs of 1000, 10000, 100000, and 1000000, respectively. It proved that the Lagrangian model well agreed with the Eulerian model with LPs of 10000 but the error became larger as the LPs numbers were smaller. To solve this issue in the 3-D simulations, number of LPs could be enhanced to an order of 10000 over grid boxes with the presence of strong convections, but this option is not implemented in the current model to keep the computational efficiency. The Lagrangian model with low numbers of LPs resultes in no redistribution of tracers (no redistribution of LPs) by the cumulus convection, which is same as the convection scheme is disabled, and thus the result will not be deteriorated too much. It is an inherent drawback of any Lagrangian models that the statistical accuracy is low in the grid boxes, where the numbers of LPs are small. The only way to resolve this issue is to enhance numbers of LPs as far as the computational resources allow.

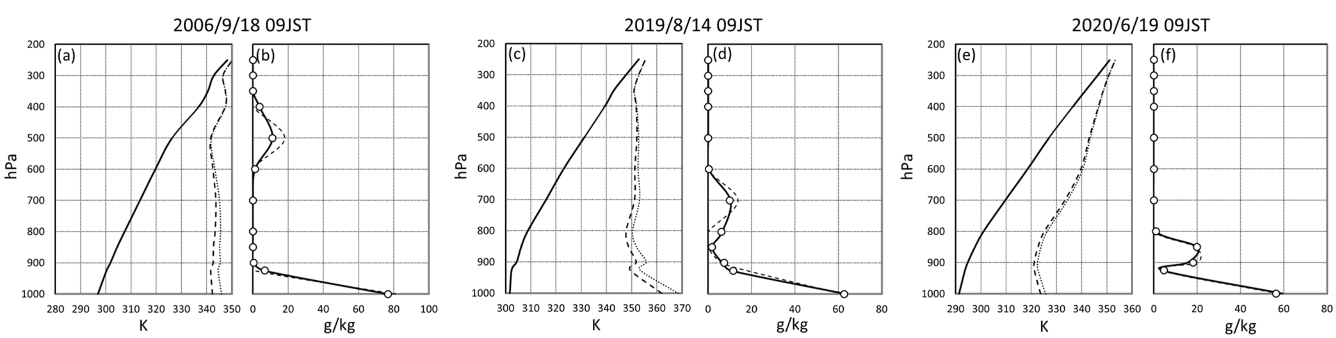

Figure S2. (**a, c, e**) Vertical profiles of (solid lines) potential temperature, (dashed lines) equivalent potential temperature, and (dotted lines) saturation equivalent potential temperature calculated based on the radiosonde measurements and (**b, d, f**) vertical profiles of mixing ratios simulated by (solid lines) original 1-D Eulerian model, (dashed lines) 1-D Lagrangian model with 1000 LPs, and (open circles) 1-D Lagrangian model with 10000 LPs.