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Plain Language Summary: A convective rainband developed along a non-classic front (outer front), which formed to the north of a warm front, associated with an extratropical cyclone. The rainband produced record-breaking heavy rainfall to Miyake Island, Japan, on 8 January 2017. This study examined roles of surface latent and sensible heat fluxes from the Kuroshio Current in the intensification of the rainband using cloud-resolving numerical experiments. Results derived from the numerical experiments indicated that the heat fluxes, especially the latent heat fluxes, enhanced the rainband by increasing the moisture content and convective instability.

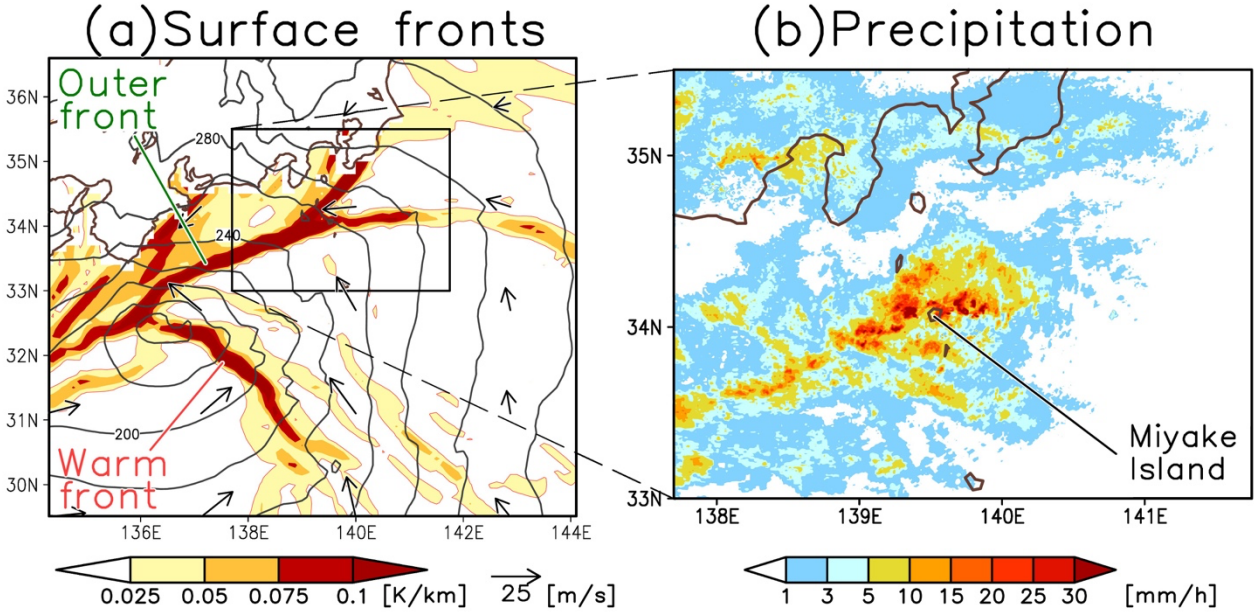

Fig. 1 (a) Map of the magnitude of horizontal gradient of potential temperature (shading; K km^{-1}), geopotential height (contours; m), and horizontal wind (arrows; m s^{-1}) at 975 hPa derived from the Japan Meteorological Agency (JMA) mesoscale objective analysis data at 06:00 UTC on 8 January 2017. The contour interval is 20 m. The closed circle denotes Miyake Island. (b) Map of precipitation intensity (shading; mm h^{-1}) derived from JMA radars at 06:00 UTC on 8 January 2017.

- A convective rainband associated an extratropical cyclone caused heavy precipitation to Miyake Island in January 2017.
- Cloud-resolving numerical experiments showed that surface sensible and latent heat fluxes from the Kuroshio Current had roles in the intensification of the rainband.
- The heat fluxes, especially the latent heat fluxes, intensified the rainband via increases in the moisture content and convective instability.