Plain Language Summary: On December 22–23, 2022, heavy wet snow accretion collapsed a transmission tower near the city of Monbetsu, Hokkaido. This study examines the weather conditions that caused this heavy wet snow accretion event, focusing on three meteorological factors: strong winds, snowfall, and temperatures just above 0°C. This day was the most favorable for wet snow accretion in Hokkaido since 1976. Numerical weather simulations show that multiple extratropical cyclones contributed to the strong winds and heavy snowfall. Cooling from snowmelt was important for maintaining temperatures just above 0°C. The combination of these weather patterns and cloud microphysical processes played a critical role in this heavy wet snow accretion event.
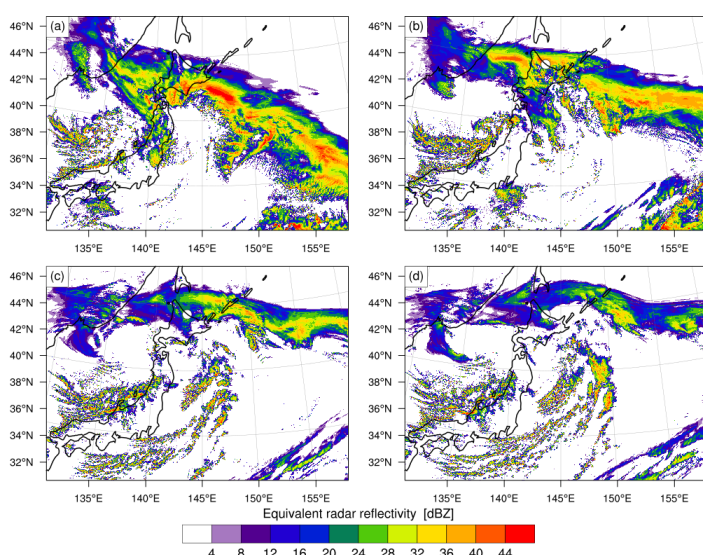
Figure 1. Simulated equivalent radar reflectivity at a height of 2,000 m ((a) 21 JST on December 22, 2022, and (b) 03 JST, (c) 10 JST, and (d) 13 JST on December 23, 2022).
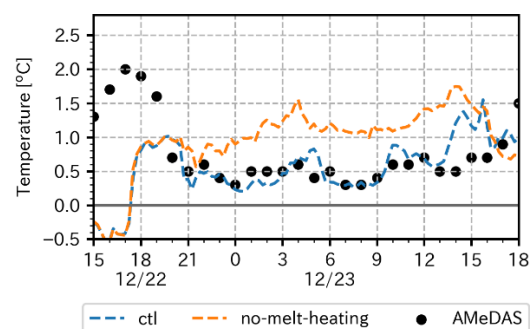

Figure 2. Time-series of the temperature at a 2-m height at Monbetsu Station from the control and no-melt-heating WRF simulations and AMeDAS (the Automated Meteorological Data Acquisition System) observation.

Highlights:
- Several extratropical cyclones brought strong winds and heavy snowfall, creating favorable conditions for wet snow accretion.
- A numerical simulation using WRF model shows that low-level moisture transport by the cold conveyor belt of a cyclone approaching eastern Hokkaido enhances snowfall from stratiform clouds through depositional growth.
- A backward trajectory analysis and a sensitivity simulation confirm that cooling from snowmelt was important for maintaining temperatures just above 0°C.