Phase Boundary Tilt during Nor'easter Events

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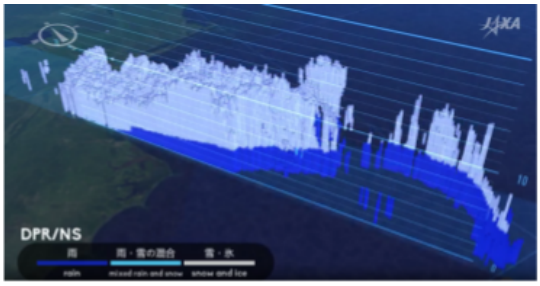
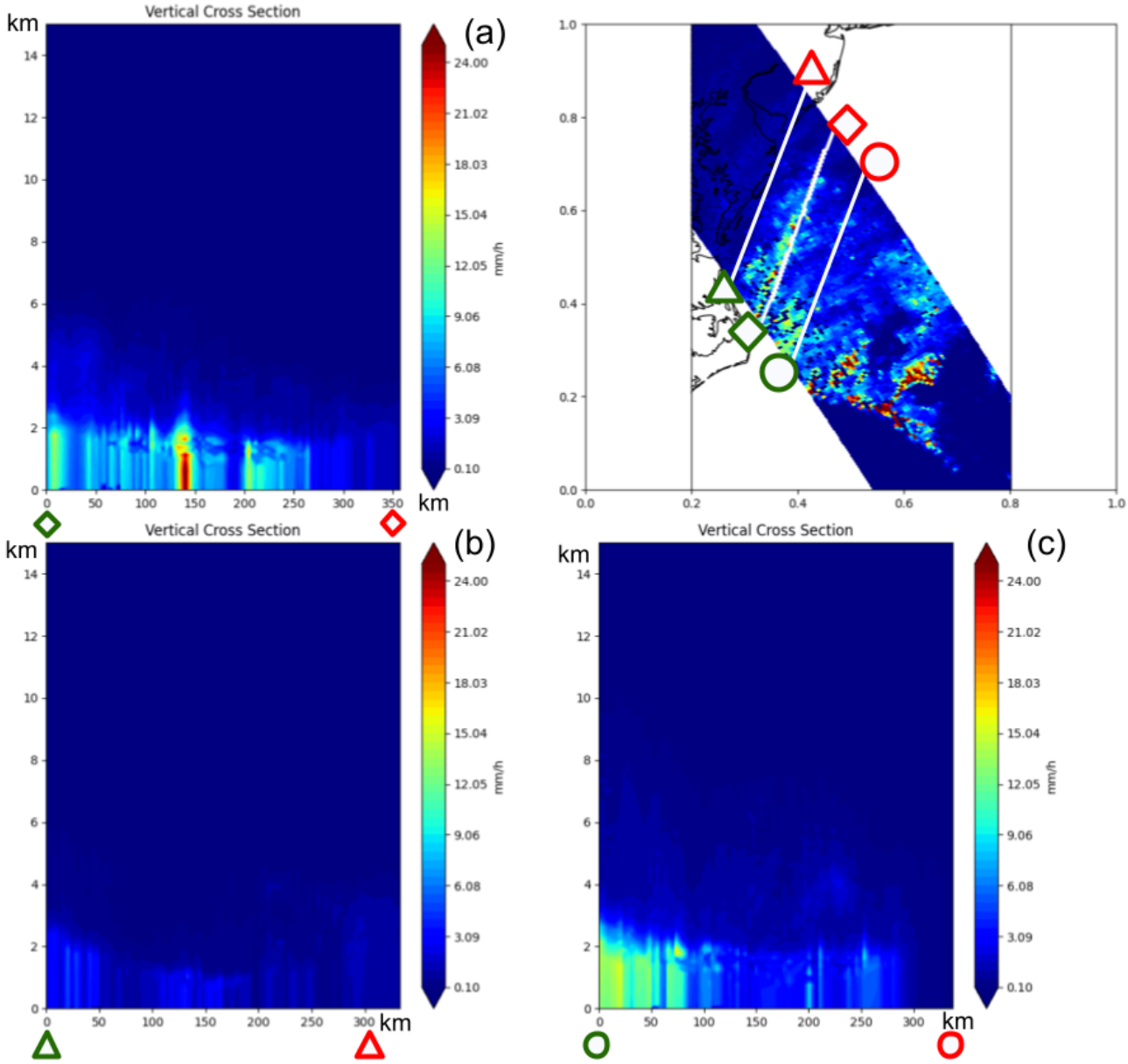
The phase boundary in clouds is generally parallel to the surface. However, in the Nor'easter clouds, which occur annually in the eastern United States, the boundary tilts 2 km in height over 100-200 km. It remains unclear why this phenomenon occurs and what impact they have. We are investigating this phenomenon with the aim of learning its causes. Using 3D precipitation data from the Global Precipitation Measurement (GPM) satellite (JAXA/NASA) obtained via G-Portal (JAXA), we show that the surface intersection of the phase boundary aligns with the coastline by calculating the liquid ratio (liquid precipitation / total precipitation). In the case of the Nor'easter on Jan 4, 2018, we found that the vertical precipitation distribution changes significantly at the surface intersection. In terms of precipitation intensity, the highest values were observed above the surface intersection, followed by the seaward side, and then the landward side. In order to clarify the mechanisms behind this phenomenon, we developed a visualization program using a code-development AI agent that enables us to quickly extract the required data fields from complex GPM datasets and visualize them in ways not supported by existing tools. The observed results suggest that the tilt of the phase boundary affects the vertical distribution of precipitation. These new insights may contribute to more precise precipitation forecasts during Nor'easter events.

Keywords: Atmospheric and Hydrospheric Sciences, GPM (Global Precipitation Measurement), Remote Sensing, Microphysics, DPR (Dual-Frequency Precipitation Radar), Bomb Cyclone





(a) Vertical profile of precipitation along a transect through the surface intersection.

(b) Corresponding profile along a parallel transect shifted landward.

(c) Corresponding profile along a parallel transect shifted seaward.