

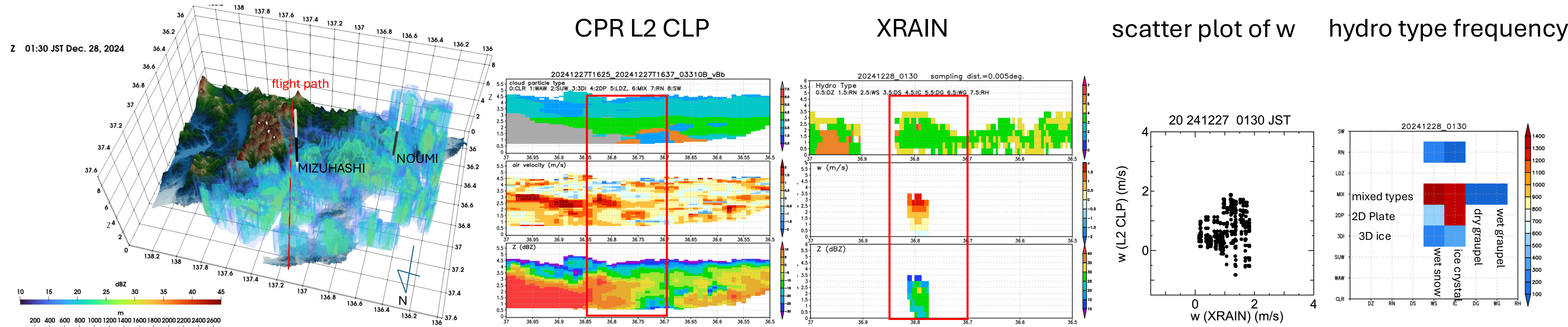
| Validation item     | EarthCARE 2A CLP (Sato et al. 2025) spaceborne nadir looking radar               | XRAIN ground-based dual-pol. radars                                                                           |
|---------------------|----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Vertical air motion | subtract particle fall velocity from Doppler velocity                            | dual-Doppler analysis: integration of divergence using mass continuity equation (pyDDA: Jackson et al., 2019) |
| Particle Type       | estimated from Z & Doppler velocity                                              | Z, ZDR, KDP, ρHV, and T (Kouketsu et al., 2015)                                                               |
| Note                | observation: nadir looking<br>sensitivity: -35 dBZ<br>vertical resolution: 100 m | observation: PPI scan (1 to 20°)<br>sensitivity: 10 dBZ<br>vertical resolution: 500 m                         |

| Date and orbit number       | case description                            | Notes               |
|-----------------------------|---------------------------------------------|---------------------|
| 27 Dec. 2024 orbit #03310B  | winter cold outbreak, weak convective cloud | surface T = 0.8 °C  |
| 03 Feb. 2025 orbit #03901B  | winter cold outbreak, weak convective cloud | surface T < -1.9°C  |
| 06 Feb. 2025. orbit #03948B | winter cold outbreak, weak convective cloud | surface T = -0.5 °C |

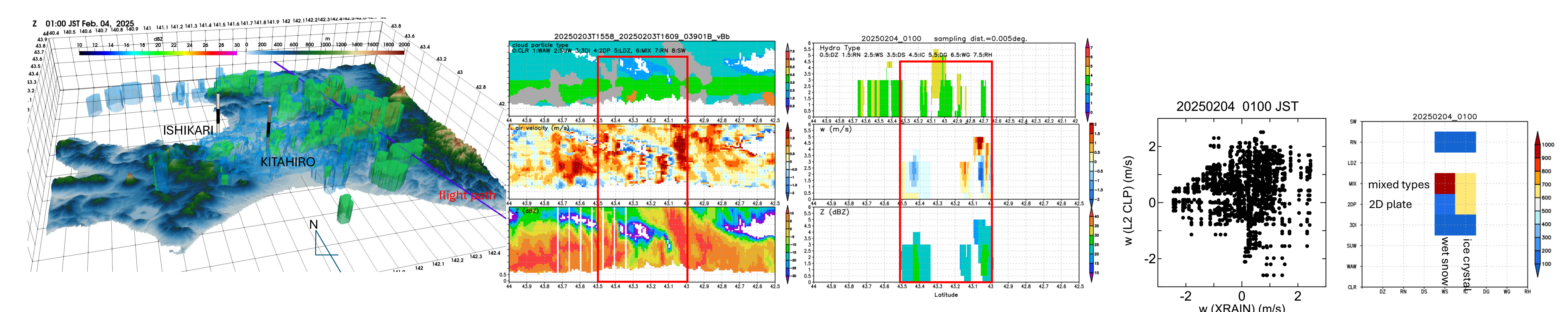
## RESULTS & DISCUSSION

- Vertical air motion: good agreement. Considering the major particle type is snow or ice crystal, direct measurement by CPR gives better estimation of vertical air motion. XRAIN has worse vertical resolution and sensitivity.
- Particle Type:
  - mixed types ↔ snow, ice crystal, dry/wet graupel
  - 2D plate ↔ ice crystal
  - 3D ice ↔ snow, ice crystal, dry graupel

### 27 Dec. 2024



### 3 Feb. 2025



### 6 Feb. 2025

