High-level clouds (ice and snow) simulated in global cloud-system resolving simulations by the Nonhydrostatic ICosahedral Atmospheric Model (NICAM), which was developed in Japan, are compared with Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) and CloudSat observations. High-level clouds (cumulonimbus and cirrus type clouds) classified by the split window (11 and 12□m) data onboard geostationary meteorological satellites (GMSs) were also compared with CALIPSO and CloudSat observations.

High-level clouds classified by the Split Window are shown in Fig.1 (left) corresponds well with cloud signals higher than 8km observed by CALIOP and CloudSat (Fig.2). Spatial distribution of column integrated ice and snow by NICAM (Fig.1 right) correlates well with that of high-level clouds classified by the Split Window (Fig.1 left).

The vertical distribution of ice and snow simulated by NICAM qualitatively agree well with those of cloud signals observed by CALIPSO and CloudSat (Fig.3). We computed corresponding cloud lidar backscatter coefficients and cloud radar reflectivity signals from ice and snow data of NICAM using Cloud Feedback Model Intercomparison Project (CFMIP) observational simulator packages (COSP). The contoured frequency by altitude diagram (CFAD) for the cloud lidar backscatter coefficients (not shown) suggests that the amount of ice is not well represented in NICAM. The CFAD for CloudSat (not shown) implies that the amount of snow is larger in NICAM simulations. Fig.4 demonstrates that NICAM has tendency of smaller amount of ice and larger amount of snow.

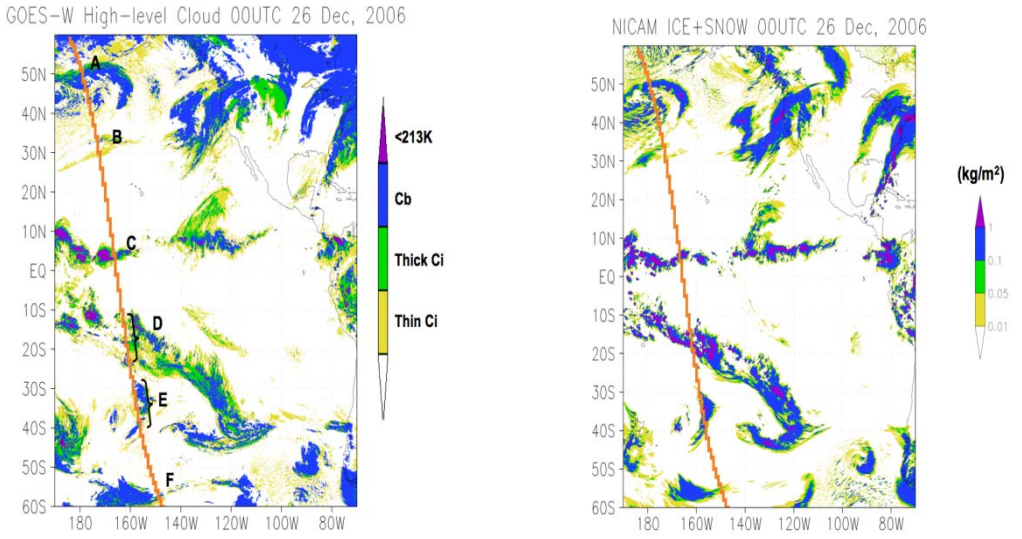

Figure 1 Spatial distribution of high-level cloud classified by the Split Window (left) and ice and snow by NICAM (right)

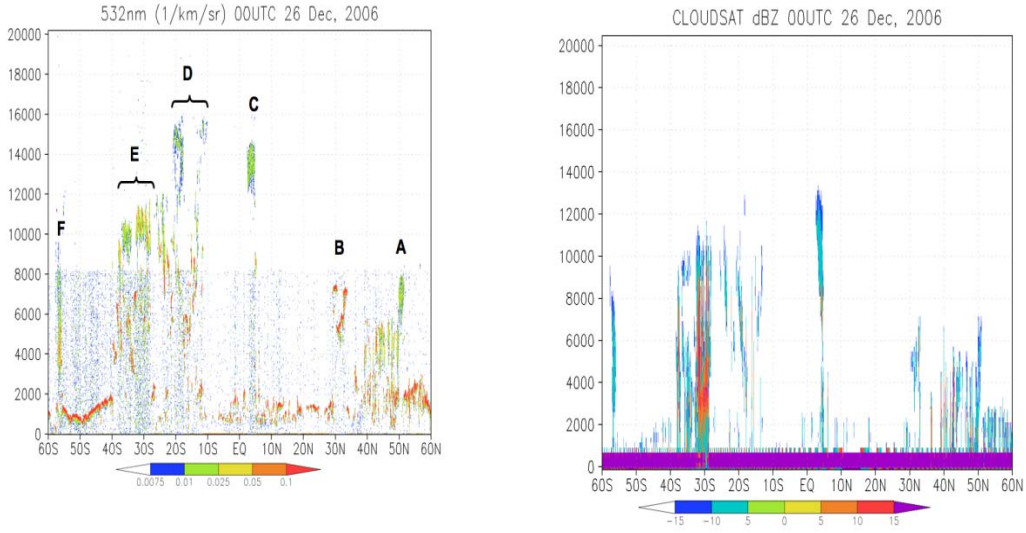

Figure 2 CALIOP (left) and CloudSat (right) observation along the track in Fig.1.

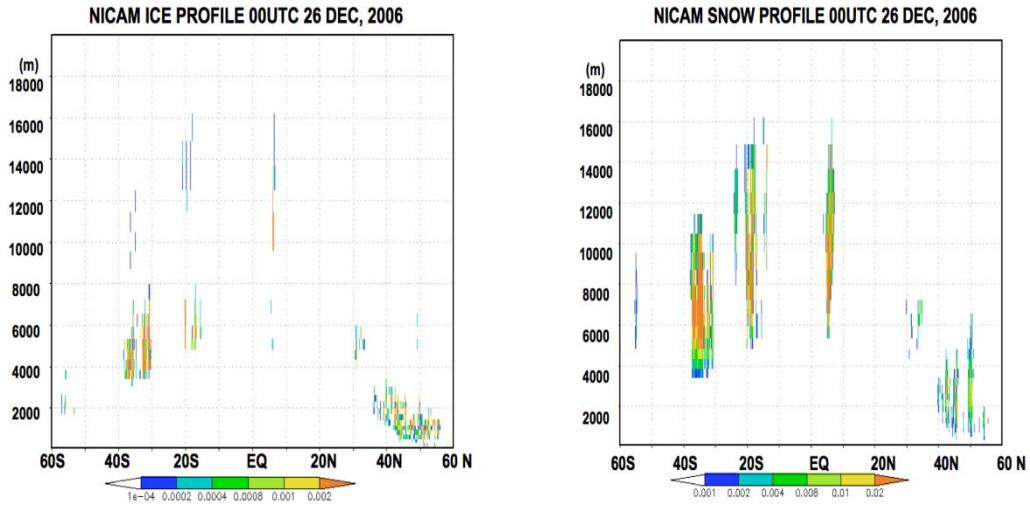

Figure 3 Vertical profile of ice (left) and snow (right) by NICAM

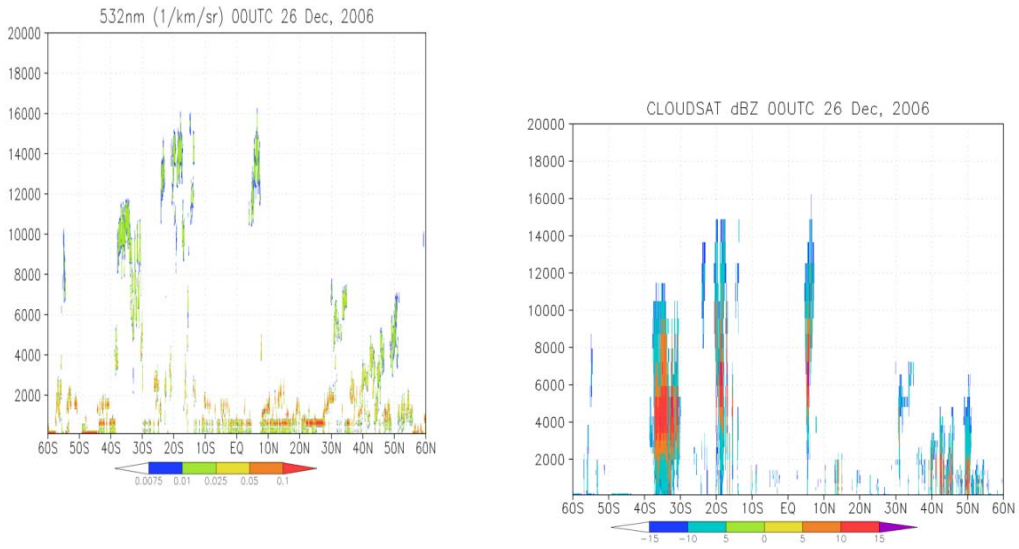

Figure 4 Vertical signals simulated by COSP using NICAM simulation data

Publications

Inoue, T., Satoh, M., Hagihara, Y., Miura, H., and Schmetz, J. (2010)

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J. Geophys. Res., 115, D00H22, doi:10.1029/2009JD012371.

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Inoue, T., D. Vila, K. Rajendran, A. Hamada, X. Wu, and L. Machado, 2009:

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