

# **Intraseasonal variability of cloud amount in middle latitude during boreal winter**

Reona Satoh<sup>1</sup>, Noriyuki Nishi<sup>2</sup>, and Hitoshi Mukougawa<sup>3</sup>

<sup>1</sup> *Graduate School of Science, Fukuoka University, Fukuoka, Japan*

<sup>2</sup> *Faculty of Science, Fukuoka University, Fukuoka, Japan*

<sup>3</sup> *Graduate School of Kyoto University, Kyoto, Japan*

The intraseasonal variability of the cloud amount in the middle latitude during boreal winter was investigated in relation to the Rossby waves with almost equivalent barotropic property.

We utilized D1 data by International Satellite Cloud Climatology Project (ISCCP), which is one of the most reliable observational datasets. In order to investigate the vertical structure of cloud, high (HCC), middle (MCC), and low cloud cover (LCC) in ERA-Interim reanalysis were also used. The periods for the analysis were January and February from 1984 to 2008, and a band pass filter was applied to obtain the time series with 15-30 day period.

We investigated the relationship between geopotential and cloud cover in the Rossby wave signal in each altitude range. In most of the longitudes, we detected the significant phase relationship that the positive anomaly of the HCC located just west of the ridge and the positive anomaly of MCC located near the trough. While the positions of the zonal maximum of the positive anomaly HCC can be explained to be almost coincident with the adiabatic upward motion in the east of the trough, those of MCC cannot be interpreted with the adiabatic motion. It may be related with the diabatic upward motion related with the synoptic disturbances.

In contrast, the relation between the LCC and the geopotential has significant zonal dependency. While the positive anomalies of LCC located near the troughs over the continents, they located just east of ridges over the oceans. The difference in the relative positions of the positive cloud amount of three layers might explain the difference of the significance in the phase relationship between the ISCCP observations of the total cloud cover and the geopotential. Over the continents, since the relative position of three cloud layers to the geopotential anomaly is similar, the relationship between ISCCP total cloud cover and geopotential is significant. Over the oceans, since the position of the positive anomaly of LCC is fairly different from those in other two layers, the ISCCP cloud cover does not have significant relationship. We found one unique phase property around the east end of Eurasian Continent. Apart from the most of the longitudes where the phase relationship is almost constant within an ocean or a continent, the zonal phase relationship between the cloud amount and the geopotential gradually but drastically changes within a narrow zonal range.