Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

MIS22-10 Room:106 Time:May 27 11:30-11:45

Snowfall on the South Kanto region under winter pressure pattern, and by south-coast cyclones

ARAMAKI, Kento[1*] ; IGA, Keita[1]

[1]Atmosphere and Ocean Research Institute, the University of Tokyo

Snowfall on the south Kanto is generally caused by synoptic-scale extratropical cyclones which pass along the southern coast of Honshu Island (so-called south-coast cyclones). However, the south Kanto on Jan. 23, 2012 experienced a heavy snowfall without such type of cyclones, under a synoptic-scale circumstance regarded as the winter pressure pattern (Hara, 2012). With regard to such winter pressure pattern snowfall on the south Kanto, Yamamoto (1984) reported a case in Feb. 8, 1984 and implied that it might have been associated with the lower layer convergence line caused by winter monsoon which bypasses the mountains of central Honshu.

In this study, the heavy snowfall on Jan. 23, 2012 was analyzed using the data of JMA Meso-scale Analysis. According to the analysis, in the synoptic scale, JPCZ (Japan sea Polar air mass Convergence Zone) was formed in the western Japan sea, and another convergence zone in the Pacific side of Honshu Island. In the latter convergence zone, a meso-scale convergence line extending to the southeast from the vicinity of the Suruga Bay located on the southwest side of the Kanto was remarkable. Environmental profile near the convergence line was unstable due to the cold air in the upper layer and the warm moist air flowing into the line so that relatively deep convections easily occur. In the vicinity of Kanto, northeast wind in the lower layer toward the convergence line and southwest wind in the middle upper layer in front of the trough were blowing, which made notable vertical shear of horizontal wind. It is believed that convections which occurred along the convergence line were advected by southwest wind in the middle upper layer toward the south Kanto located downwind, and brought snowfall there.

The vertical structure of the equivalent potential temperature in the vicinity of the Kanto were compared between the heavy snowfall on Jan. 23, 2012 and a typical case of the south-coast cyclones on Feb. 8, 2014. The equivalent potential temperature difference in the vertical direction was small (weak stratification) on Jan. 23, and large (strong stratification) on Feb. 8. Based on this result, 46 heavy snowfall events in Tokyo or Yokohama in the past 30 years were analyzed in respect to the vertical structure of the equivalent potential temperature in the vicinity of Kanto using the data of JRA-55, and as a result, 4 out of 46 (8.7%) were extracted as the cases whose stratification were as weak or weaker than that of Jan. 23, 2012, and 42 out of 46 (91.3%) as the cases of stronger stratification. 86 snowfall days (no distinction between heavy and light) in Tokyo in the past 10 years were analyzed using the same technique, and as a result, 29 out of 86 (33.7%) were extracted as the cases of the “weak” stratification, and 57 out of 86 (66.3%) as the cases of “strong” . In comparison with the contribution in the heavy snow cases, the contribution of “weak” stratification is relatively large in the snowfall days. Although only the information of precipitation and equivalent potential temperature were used in the classification, the features of the composites of the cases classified as “weak stratification” show the winter pressure pattern which resembles that of the case of heavy snowfall on Jan. 23, 2012, and those as “strong” show the south-coast cyclone pressure pattern which brings heavy snowfall on the south Kanto; it shows the validity of the classification. Through this analysis south-coast cyclones are confirmed to be the major factor in the south Kanto snowfall, while it is elucidated that the event on Jan. 23, 2012 was not the sole case of heavy snowfall under winter pressure pattern.

Keywords: snowfall on the South Kanto region, winter pressure pattern, south-coast cyclones, low level convergence, stratification