Outline of the Automated Continuous Snowdrift Transport Rate Observation System and Analysis of the Conditions Necessary for Drifting Snow to Occur in Light of Meteorological Factors

SUMMARY

The snowdrift transport rate is an important physical quantity that is used for formulating snow control facility installation plans and assessing the degree of snowstorm danger. The snowdrift transport rate is defined as the mass of snow particles that passes a unit width perpendicular to the wind direction per unit time. Because it is difficult to directly and continuously measure snowdrift transport rates, the empirical equations are usually used for estimating the snowdrift transport rate. But, in those equations, meteorological factors except for the wind velocity have not taken into account. In order to estimate the rate more accurately, it is necessary to consider the blowing snow occurrence conditions taken into account the multiple factors. For example, the air temperature, the condition of the snow surface, and the presence or absence of falling snow.

In this presentation, we talk about two main topics as follows.

1. Outline of the “Automated Continuous Snowdrift Transport Rate Observation System”
2. Analysis results of the Occurrence conditions of blowing snow without concurrent falling snow

The Civil Engineering Research Institute for Cold Region (CERI) installed an automated continuous snowdrift transport rate observation system at its Ishikari Blowing Snow Test Field for the purpose of measuring the snowdrift transport rate directly and continuously. This system is equipped with multiple Snow Particle Counters (SPC) and supersonic anemometers that are installed on an observation tower at various heights, from 0.1 m to 7 m. Real-time observation data on snow mass flux and wind velocity are displayed and can be accessed online.

About the occurrence conditions of blowing snow, we used the observation data obtained in three observation site in Hokkaido. In this analysis, meteorological factors were taken into account in terms of the influence each factor has on the occurrence of blowing snow. Equations were developed by using discriminant analysis for determining the conditions under which blowing snow does or does not occur. The factors used for the discriminant analysis are as follows: current wind velocity, current air temperature, time elapsed since the end of snowfall, maximum temperature and wind velocity since the end of snowfall, cumulative value of the fourth power of hourly wind velocity since the end of snowfall, cumulative value of insolation since the end of snowfall, snow depth in the most recent snowfall event before blowing snow occurred, and cumulative snowfall. The equations developed in this study were proven to be useful because the conditions under which blowing snow does or does not occur were predicted with 91.1% accuracy.