Applicability of Winter Road Maintenance Standard Establishment Assistance and Radar Technology to the Determination of Snowfall

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1. Introduction

Although absolute snowfall amounts are on the decrease, large amounts of snowfall have occurred locally and briefly causing traffic disruption. In addition, the accumulation of snow has occurred in areas, such as Shikoku and Kyushu, where the accumulation of snow does not occur consistently, in addition to the areas where it occurs frequently. The information required to determine the necessity of snow removal is the information on *when, where, how much (amount),* and *how long* the snow continues to fall. Traditionally, such information has been obtained from weather (forecast) data, rain meters, and CCTV, etc., and road administrators judge such information in a comprehensive manner for snow removal.

In recent years, the Ministry of Land, Infrastructure, Transport and Tourism has worked to maintain an X-band radar rain meter (hereinafter referred to as "radar") to determine rains, such as concentrated heavy rain. If the information obtained from this radar can be applied to the determination of snowfall, it can contribute to the realization of appropriate snow removal actions. Therefore, NILIM is considering the possibility of determining snowfall using radar, as well as the form of reflection in snow removal activities in the event of snowfall.

2. Consideration of Snow Detection Performance Using Radar

Radar for determining heavy rain utilizing microwaves (9.7 GHz) can determine the location and amount of rainfall, wind direction, and wind velocity in units of 250 m mesh with a detection range diameter of approximately 60–80 km (it varies slightly depending on the weather). In order to utilize this radar as one of a kind of snow depth meter, it is necessary to consider whether the existence and amount of snowfall can be determined or not.

Figure 1 shows the comparison between the radar data of snowfall that occurred in Nagaoka city, Niigata Prefecture on January 24–26, 2016, and the data of rainfall and snowfall amounts at a neighborhood point measured by the Japan Meteorological Agency. The existence of snowfall was almost consistent between the data obtained by the Japan Meteorological Agency and the radar data, although it was partially different. On the other hand, the amount of snowfall was significantly different between them.

Since the reflected waves of the radar are intended to determine the amount of rain, it is necessary to consider the utilization of methods, such as the dynamic window method, which is a rainfall amount determination correction method based on C-band radar for determining rainfall, as well as the combination of other sensor information, such as telemeter and CCTV, when determining the amount of snowfall.

3. Future Plans

We are planning to advance the consideration of the determination of the amount of snowfall based on the radar, as well as on the determination of the timing to initiate snow removal, judgment on the probability of occurrence of drifting snow as well as provision of information, and judgement of the probability of occurrence of disaster based on snowfall record data as a form of utilizing the information obtained.

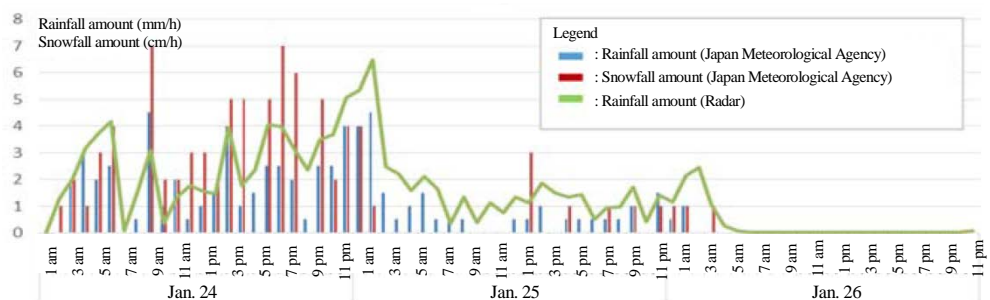http://www.hkd.mlit.go.jp/kanribu/chosei/fuyutopia/PDF/34T_H.pdf

Figure-1: Comparison between the data obtained from an X-band radar rain meter and the data obtained by the Japan Meteorological Agency