

Networking observations with rapid-scanning radars and dual-pol radars for the applications of snow retrieval and cloud development

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Every winter there are a lot of heavy snow events along the coastline of the Sea of Japan, which cause major traffic disruptions. A meteorological convergence zone, referred to as "JPCZ", Japan sea Polar air mass Convergence Zone, is one of the phenomena producing heavy snowfall caused by the orographic effect from the mountain ranges around the base of the Korean peninsula. The snow clouds are produced within the JPCZ and can rapidly develop as they move toward Japan, because the warmer currents located in south of the sea enhance the water vapor and thermal flux from the sea into the boundary layer, similar to Lake-Effect snow processes notable in the United States except on larger scales. Therefore, it is important to detect and track the cloud's development. Weathernews Inc. (WNI) attempts to improve the snow analysis not only with maximized use of existing infrastructure such as meteorological satellites and operational radars, but also with WNI's X-band, rapid-scanning weather radars. WNI has been operating a network of 80 compact, adaptive, X-band, weather radars in Japan since 2010. The first radar design, referred to as the "WITH Radar", is an integration of a modified commercial airborne weather radar (single polarization), signal-processing unit, and pedestal with the goal of minimizing both initial development and on-going maintenance costs. The purpose of the radar network is to conduct radar-based customer support, and the scanning strategies are optimized based on observed weather patterns. Moreover, the Japanese government, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), has deployed X-band dual-polarization radars, referred to as XRAIN, since 2010. Currently, there are 39 XRAIN radars across Japan. XRAIN is operated in order to obtain detailed information about rainfall/snowfall near the surface and their scan strategies are focused on frequent scanning at the lowest elevation angle. The two types of weather radars have different roles: XRAIN provides dual-polarization data near the surface and the rapid-scanning WITH radars operate in higher elevations to observe vertical structures of the weather phenomena.

In this project, we are investigating heavy snowfalls in Niigata prefecture produced by JPCZ and use data from two WITH and two XRAIN radars. In this presentation, we'll discuss the advantages of using networks of complementary radars for coordinated observations and present an estimation of snow classification aloft from dual-polarization hydrometeor classification algorithms. Future possibility of radar application will also be discussed, including the planned deployment of new low-cost, portable X-band weather radars.

Keywords: Snow classification, Dual-polarimetric radar, Rapid-scanning radar, Networking radar deployment