

# The Wind Profiler Network of Japan Meteorological Agency

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## 1. Introduction

In April 2001 the Japan Meteorological Agency (JMA) started the operation of the Wind Profiler Network and Data Acquisition System (WINDAS) to enhance capability of watching and predicting severe weather events. The network consists of twenty five 1.3GHz wind profilers installed across Japan and a control center at the JMA headquarters in Tokyo. The number of profilers has been increased from 25 to 31 by June 2003.

## 2. Objectives of WINDAS

On the basis of the development of science and technology on atmospheric radars from 1970s, wind profiler networks have been operated since 1990s by NOAA and by European countries. JMA also decided to install an operational wind profiler network across Japan in 2000 (Ishihara and Goda, 2000). The major objective of WINDAS is to provide initial wind fields for the operational numerical weather prediction (NWP) models. Special attention has been paid to enhance the performance of the mesoscale numerical model (MSM). The data have been put onto GTS(Global Telecommunication System) every hour for global exchange since April 2002.

## 3. Characteristics of WINDAS

The locations of 31 wind profilers were selected giving the highest priority over the middle and western regions of Japan, where are suffered from heavy rain storms almost every year. The intervals of wind profiler sites are from 67 to 262 km and 130 km on average. The profilers of WINDAS were designed based on the technologies developed by the Kyoto University. The characteristics of WINDAS are as follows : 1)high transmitting power(1.8kW), 2)high antenna gain(33dB), 3)8 bits coding pulse compression technique, 4)intense clutter fences to prevent ground clutter, 5)semi-globe radomes against heavy snowfall, 6)automated data quality control, and 7)remote operation of the wind profilers from the control center in Tokyo. The data availability on real-time over the profilers has been over 98%. The causes of system failures has mainly come from communication lines and power supply.

## 4. Data Quality Control and Data Accuracy

Signal processings as well as data quality control are the keys to keep profiler data in high quality. The processes specific to WINDAS are the estimation of Doppler spectrum moments using the Gaussian function fitting developed by RASC and the quadratic surface check for wind components produced by JMA. The most anomalous measurements has occurred by migrating birds. Echoes from migrating birds has appeared mostly in the night of spring and autumn under the fair weather conditions. In October 2001 when birds actively migrated over half of the WINDAS sites, 12% of the total amount of WINDAS data were contaminated by migrating birds. The quality control to detect migrating bird echoes has been introduced into the signal and data processings since December 2001. Height coverages of wind measurements by WINDAS were 6 to 7 km in moist summer and 3 to 4 km in dry winter. It has been confirmed by comparisons with the model forecast winds that the accuracy in wind measurements of WINDAS is comparable to that in rawinsonde measurements.

## 5. Impact on NWP

The data of WINDAS have been used as initial values in all the NWP models of JMA since June 2001. The 4-dimensional variational data assimilation scheme (4D-VAR) has been introduced in MSM since April 2002 to make the best use of the potential of WINDAS being capable of continuous measurement of winds aloft. The combination of WINDAS data and the 4D-VAR has well improved the accuracy of the numerical forecast for severe rainstorms.