

Upper Air Observations by Japan Meteorological Agency



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Japan Meteorological Agency



JMA's mascot "HARERUN"

Weather Observations by Japan Meteorological Agency

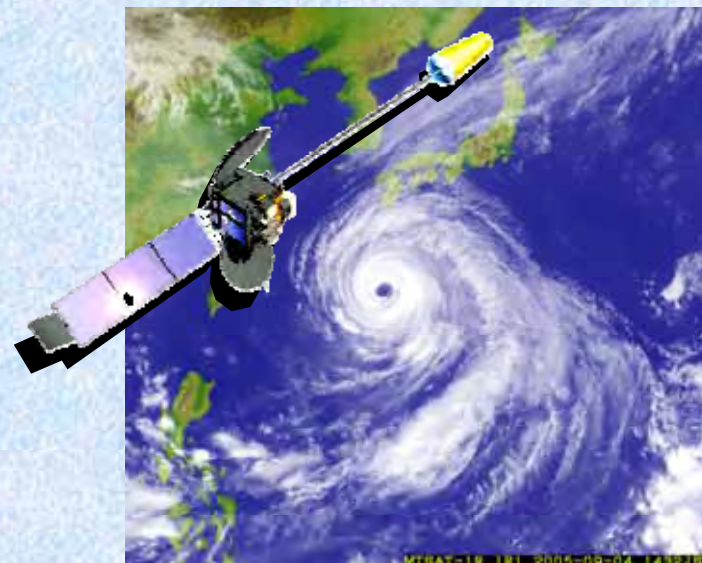
Surface Observation



Radar Observation



Satellite Observation



AWS Network AMeDAS



Wind Profiler Observation

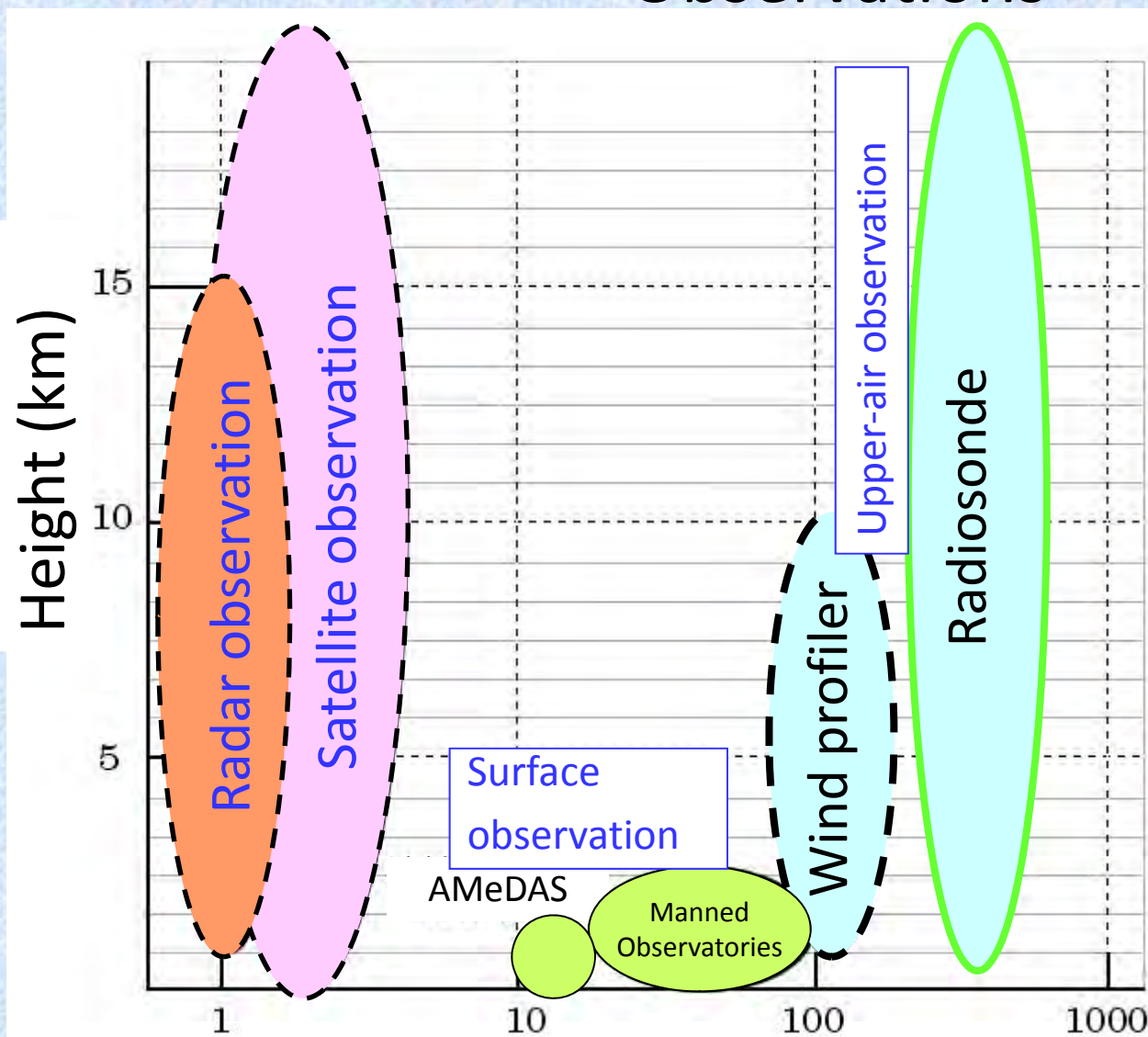


Soundings

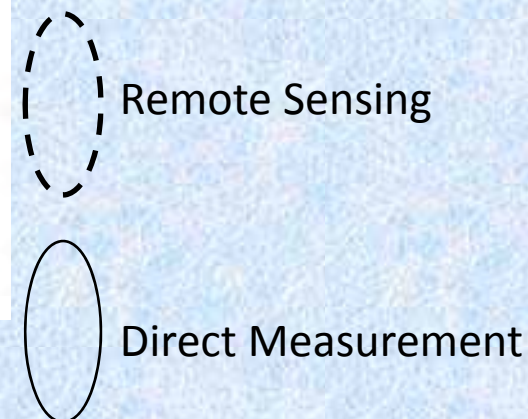


**Observations Department
Japan Meteorological Agency**

Observations



Observations to clarify various processes over a wide range of space and time scales.

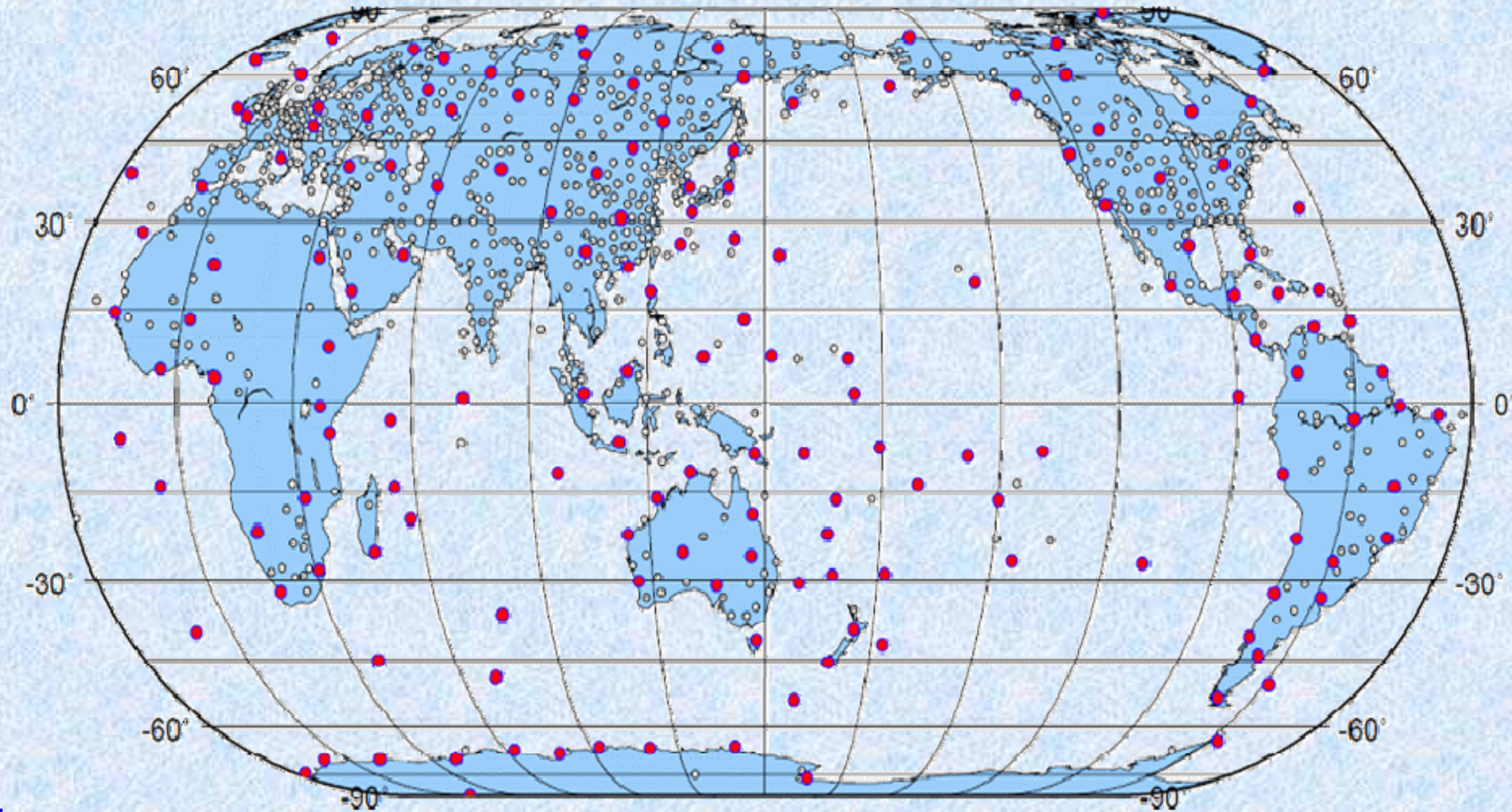


Horizontal resolution (km)

World Upper Air Network (Radiosonde)

○ :Sounding site(850)

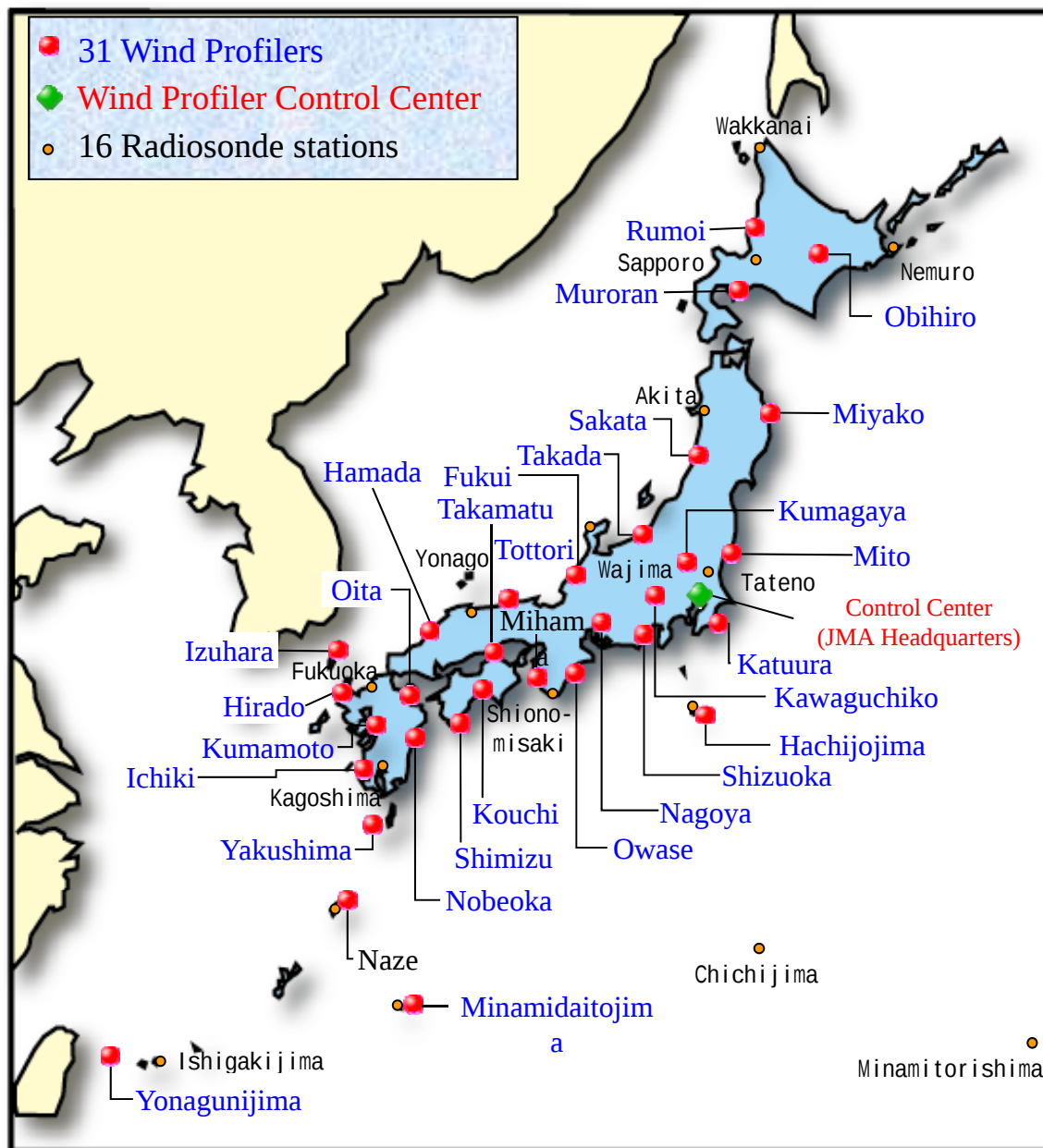
● GUAN site(166)



WMO Radosonde catalog(Jan.2007)



JMA Upper-air Observation Network



- JMA upper-air observation network consists of 31 wind profilers and 16 rawinsonde stations.
- Upper-wind observations are made at the interval of about 120km.

ABL (Automatic Balloon Launcher and sounding)

Flow of sounding that uses ABL

Sounding preparation

- Ground Check
- Loading the Radiosonde and Balloon onto a tray



The sounding program starts at the specified time



Start the ABL

- Select tray
- Activating Radiosonde
- Radiosonde signal check



Balloon filling



Balloon release (Sounding start)



Sounding



TEMP Message coding/sent



Sounding stop



Sounding preparation



Selecting tray

Balloon filling



Balloon release



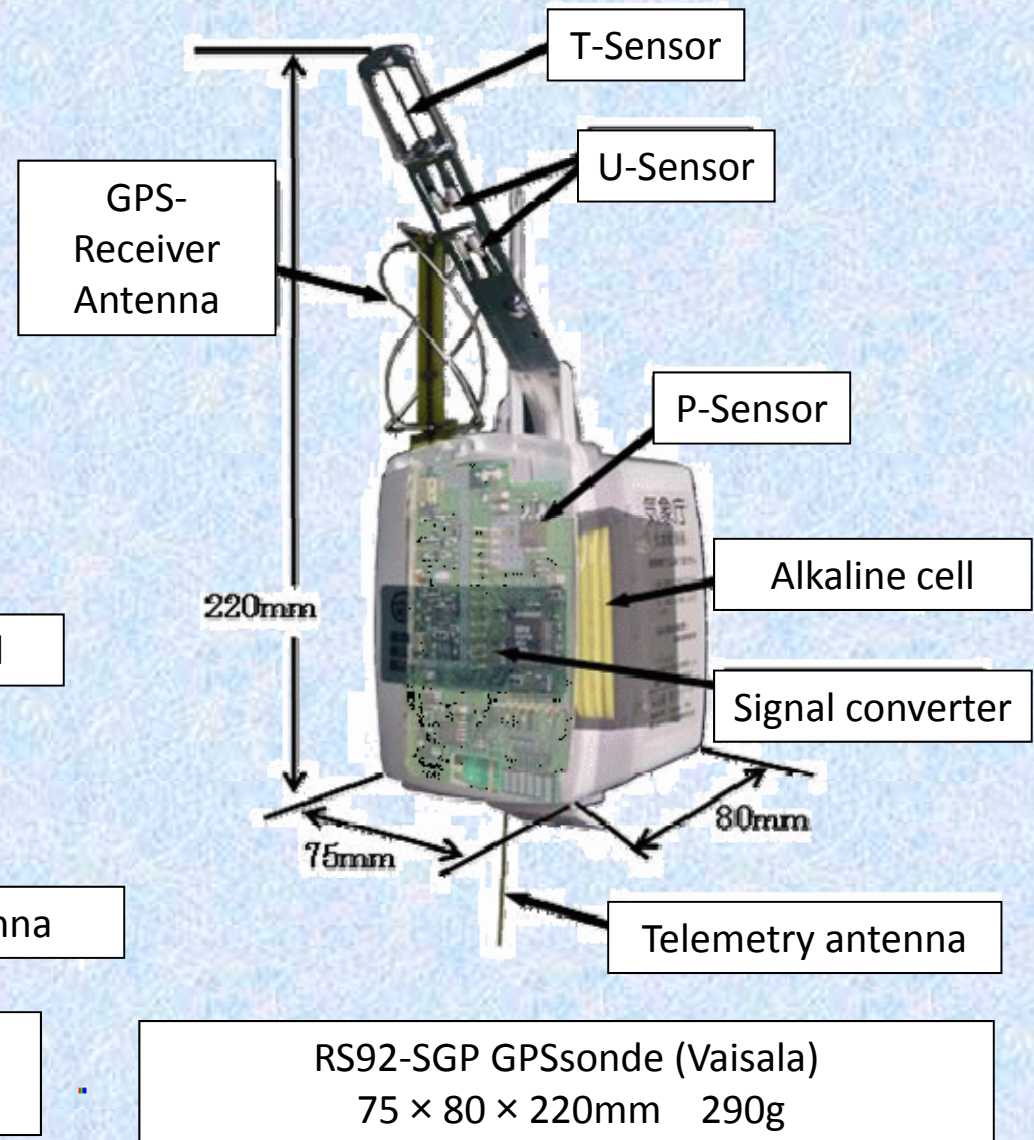
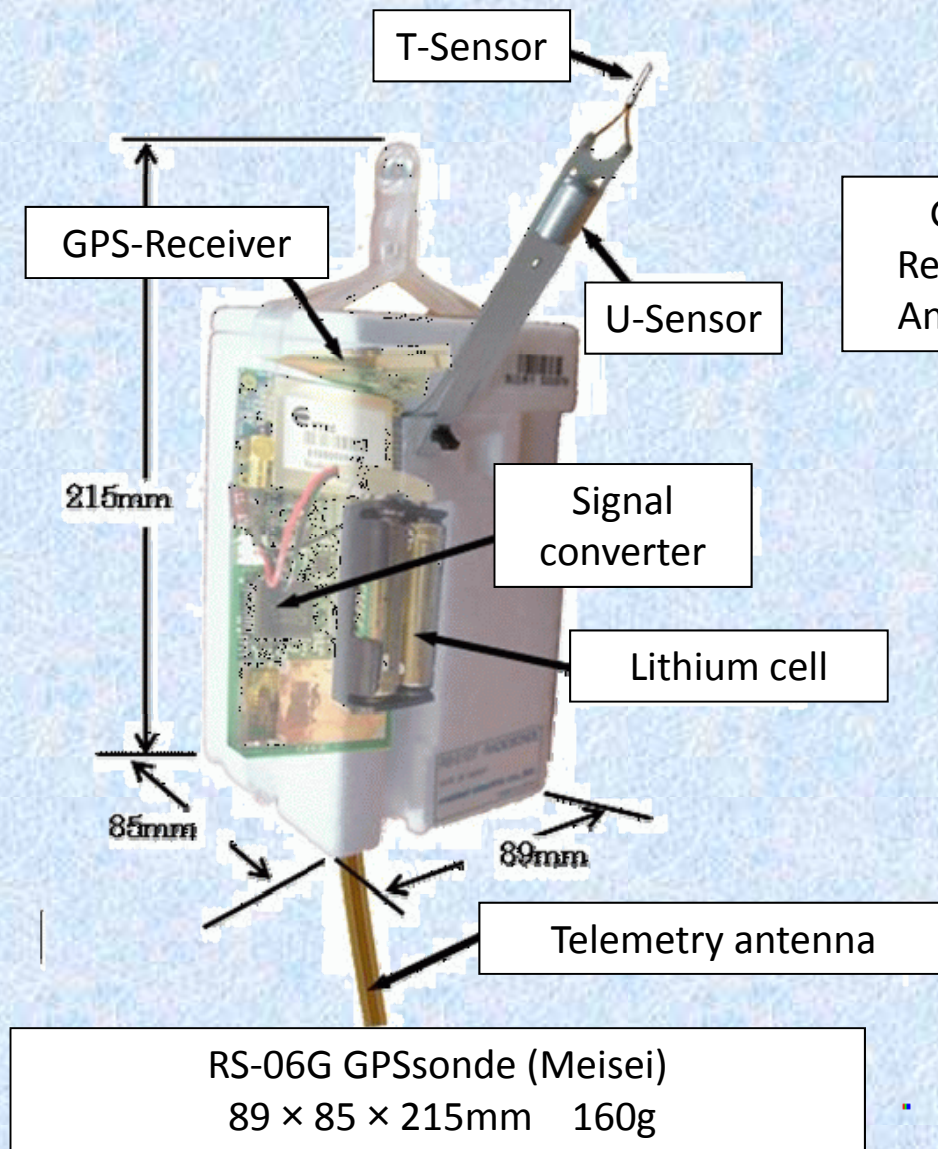
[Video \(calm\)](#)

[Video \(Strong Wind\)](#)

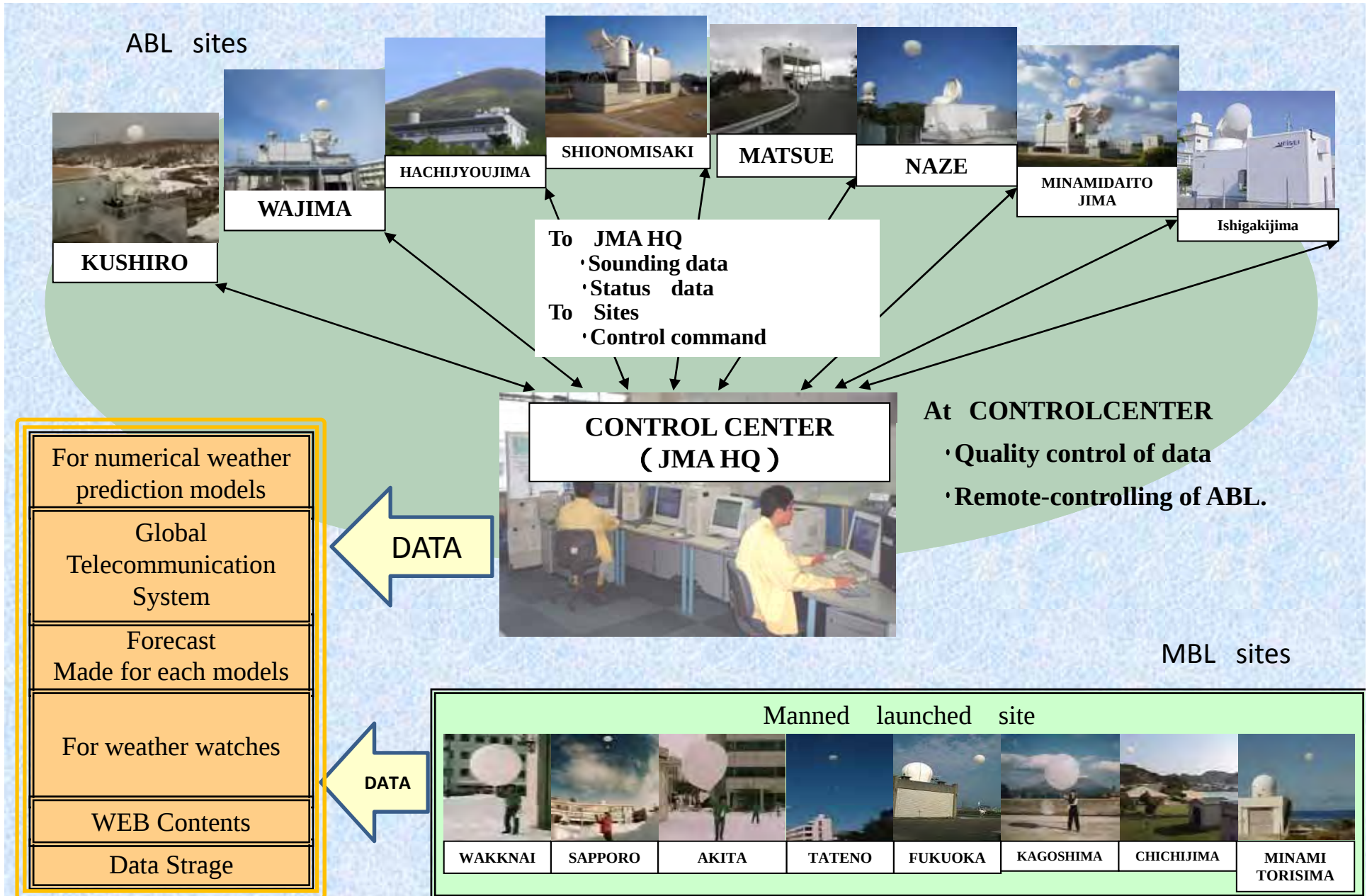


Sounding

GPS radiosonde types witch JMA uses

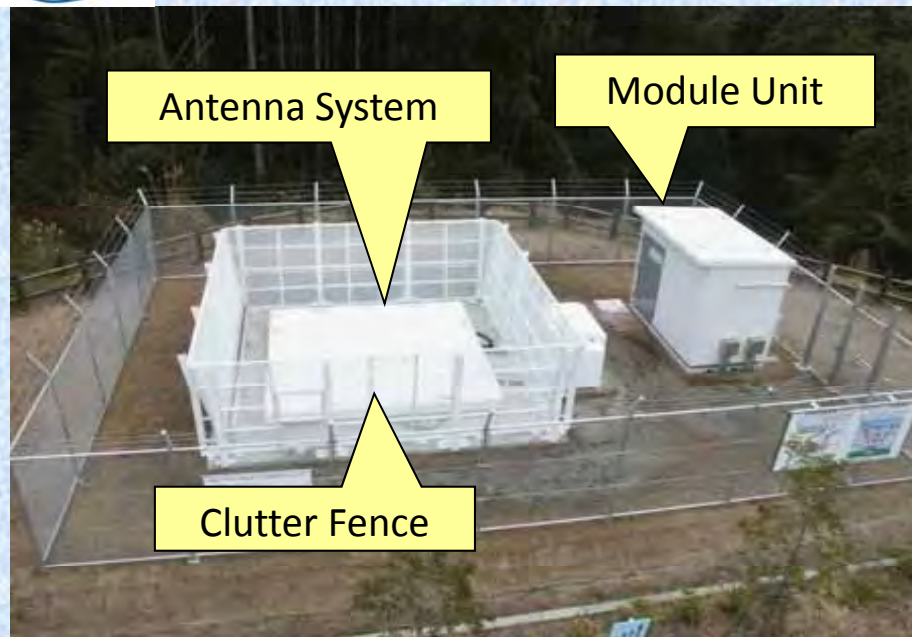


Data Flow in Soundings of JMA





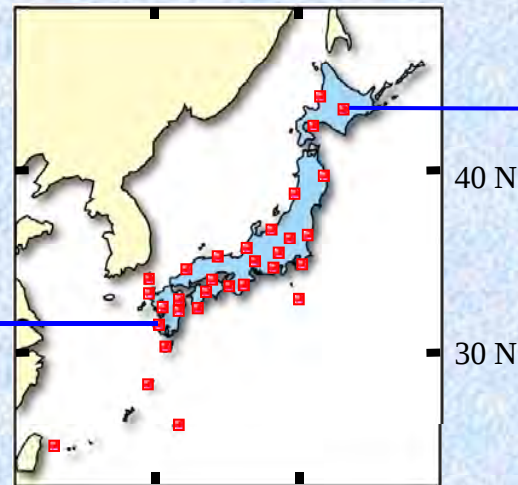
Appearance of Profiler



Standard type
(47848 Ichiki, Kagoshima)



Radome type
(47147 Obihiro, Hokkaido)

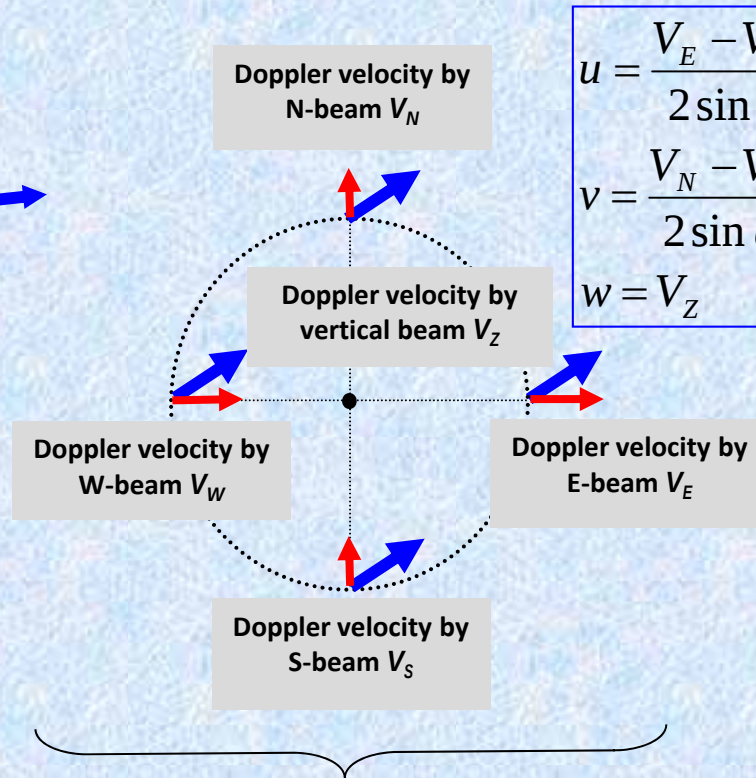
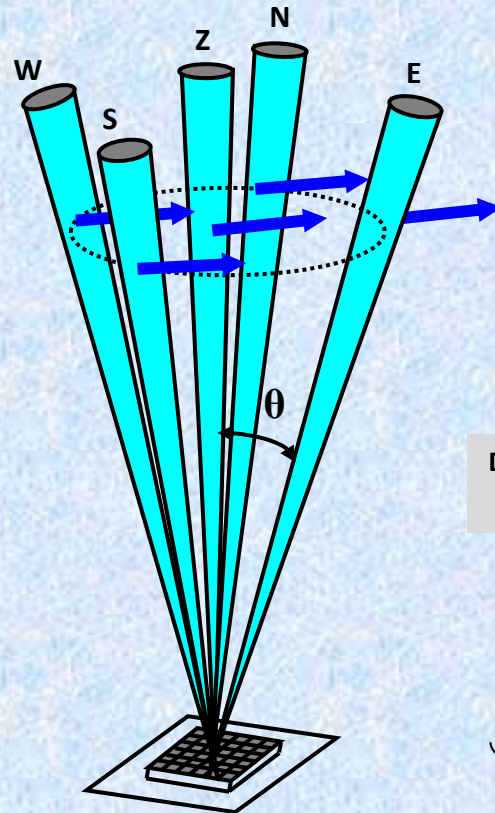


130 E 140 E
Wind Profiler in JMA



Wind Measurement using Wind Profiler

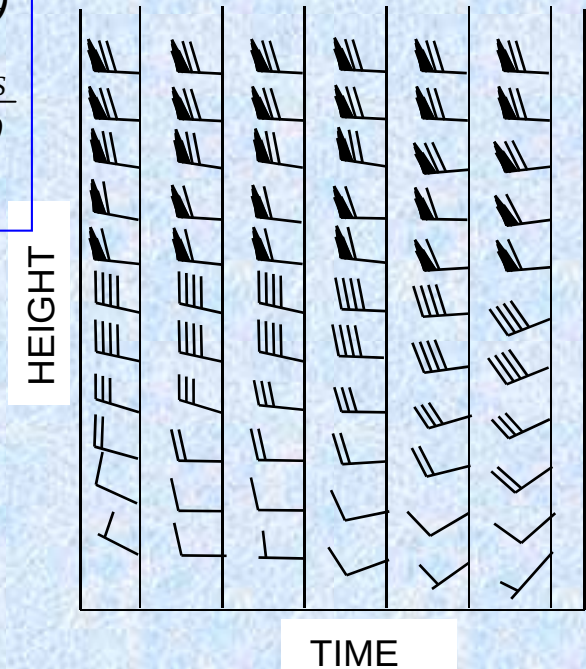
Wind vector (u, v, w)



$$u = \frac{V_E - V_W}{2 \sin \theta}$$

$$v = \frac{V_N - V_S}{2 \sin \theta}$$

$$w = V_Z$$



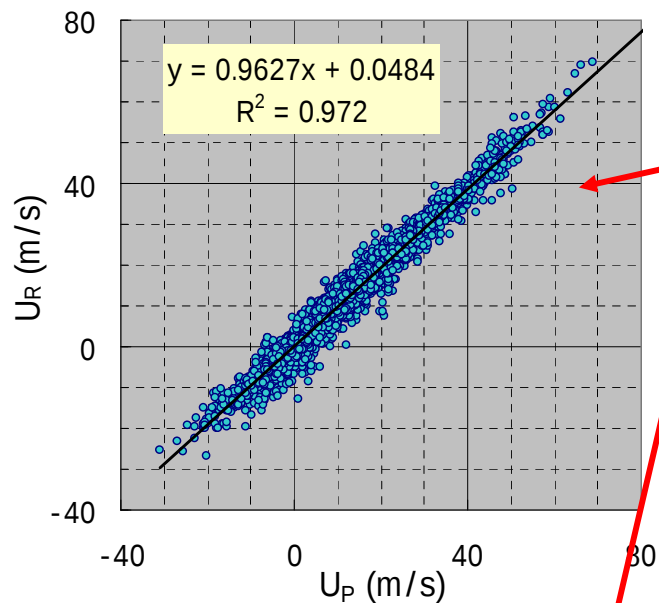
Beams are emitted toward five directions.

Wind direction and wind speed are calculated from five Doppler velocities.

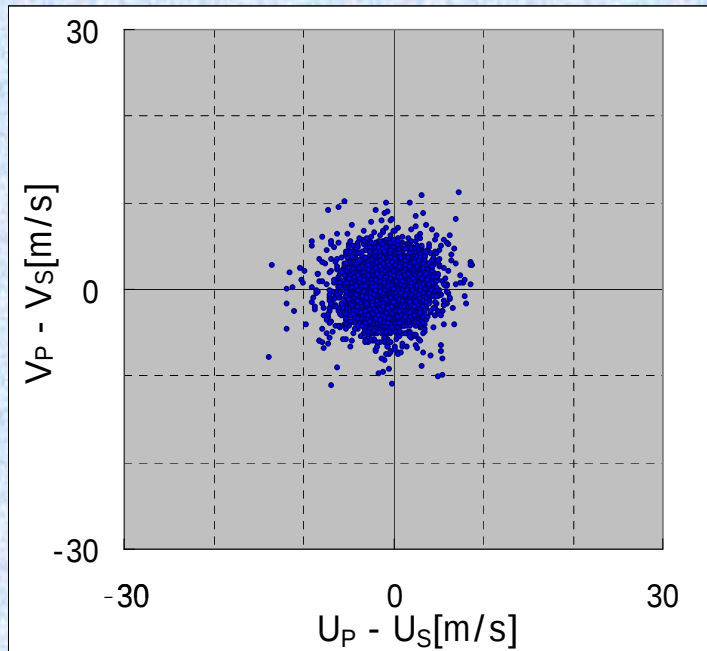
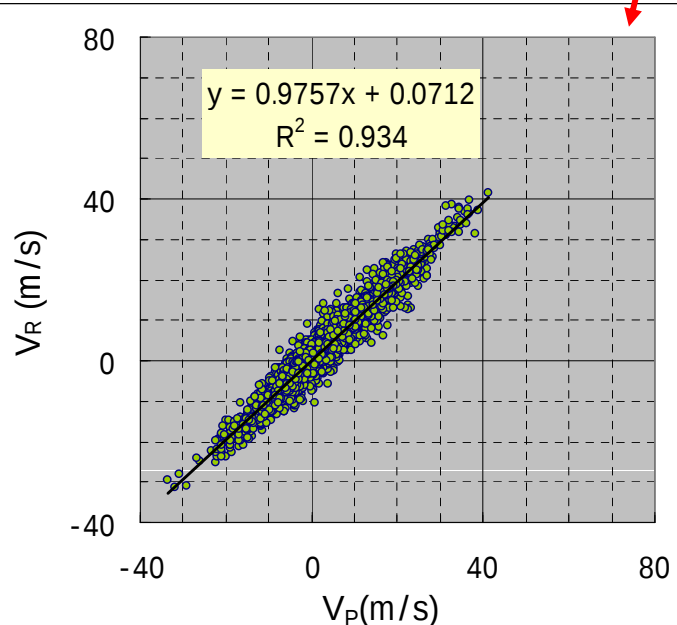
Vertical profiles of wind direction and wind speed from near the surface to nearly 5 km levels are obtained.



Comparison of Rawinsonde and Wind Profiler Measurements



Correlation of u- and v- component measurements for the wind profiler and the rawinsonde, both located at Hachijyojima in 2008.



u-component:

avg. -0.36m/s

std. 2.13m/s

v-component:

avg. -0.02m/s

std. 2.06m/s

Differences between wind profiler and rawinsonde wind component measurements (N=7514).



Example of ground echo rejection

Atmospheric echo

Upper wind

Main lobe

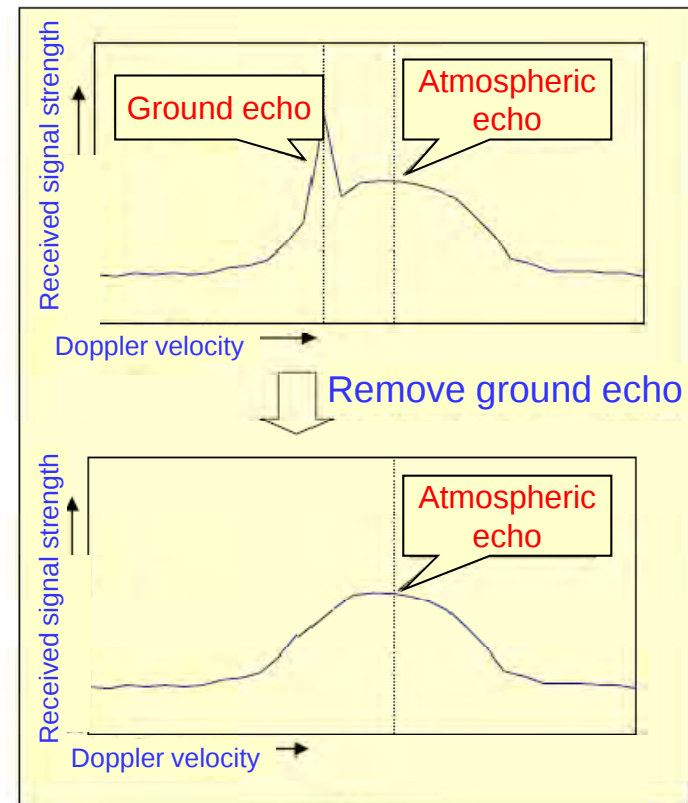
Side lobes

Antenna

Ground echo

Clutter fence to prevent ground echo

Eliminating spectral component around zero-velocity in the Doppler velocity spectrum.



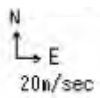


Example of migrating-birds echo

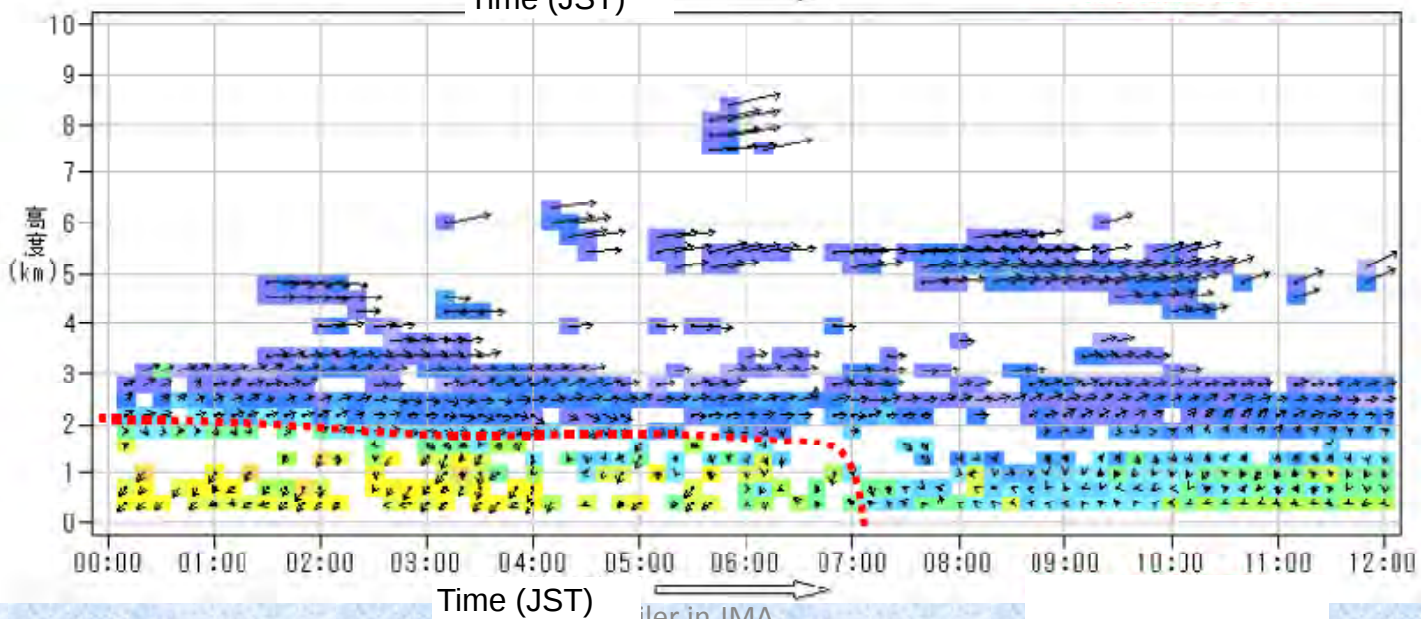
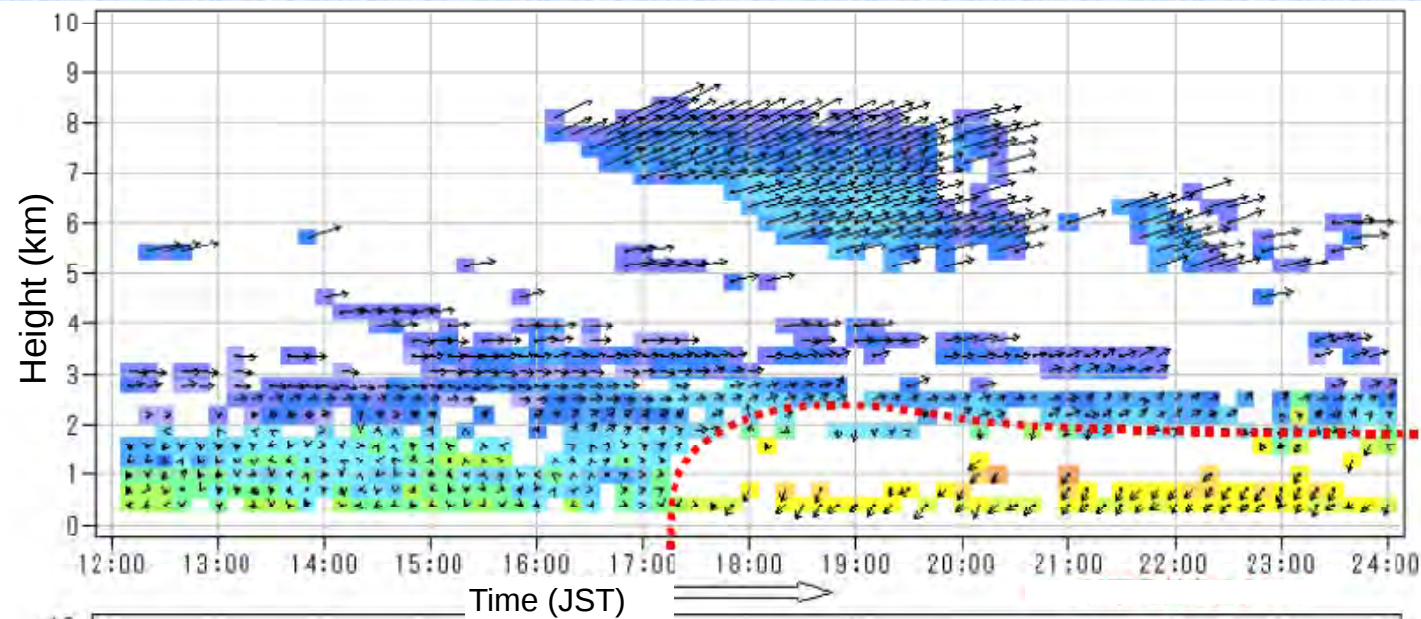
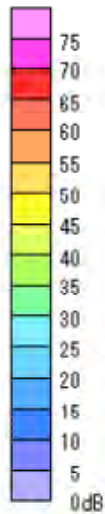
Fukui
(47616)

19 NOV
2002

wind



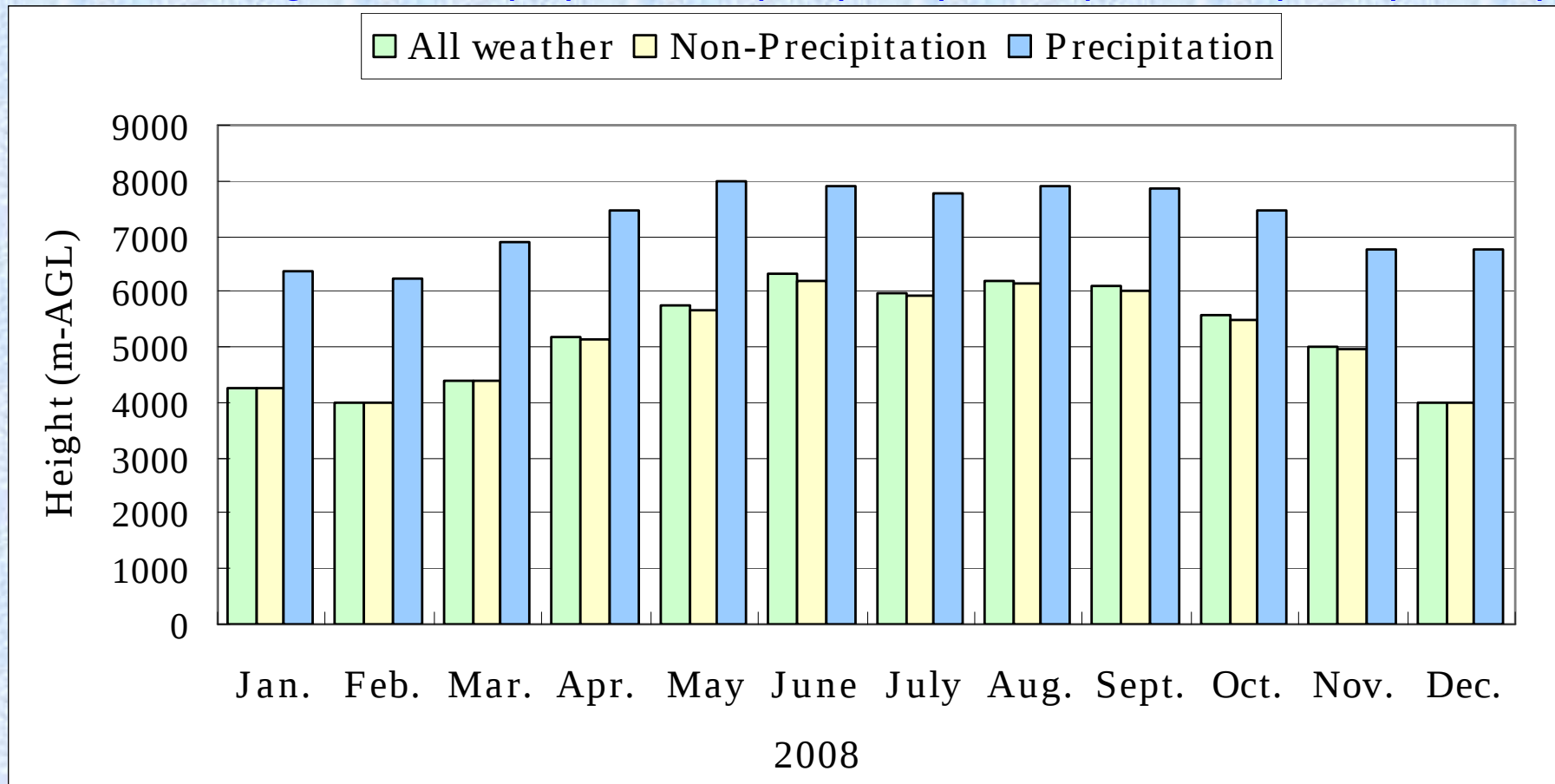
S/N比





Observation Height Coverage of WINDAS

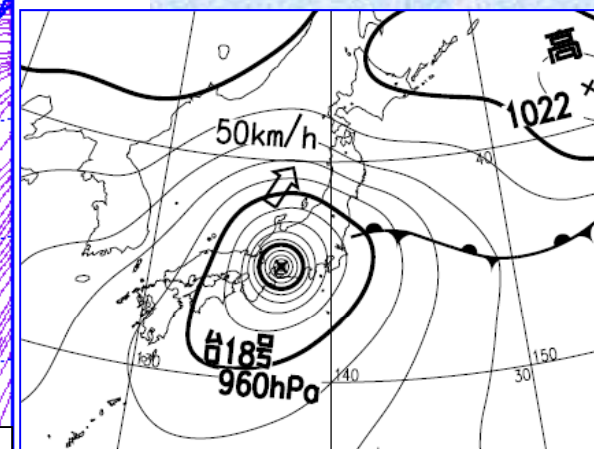
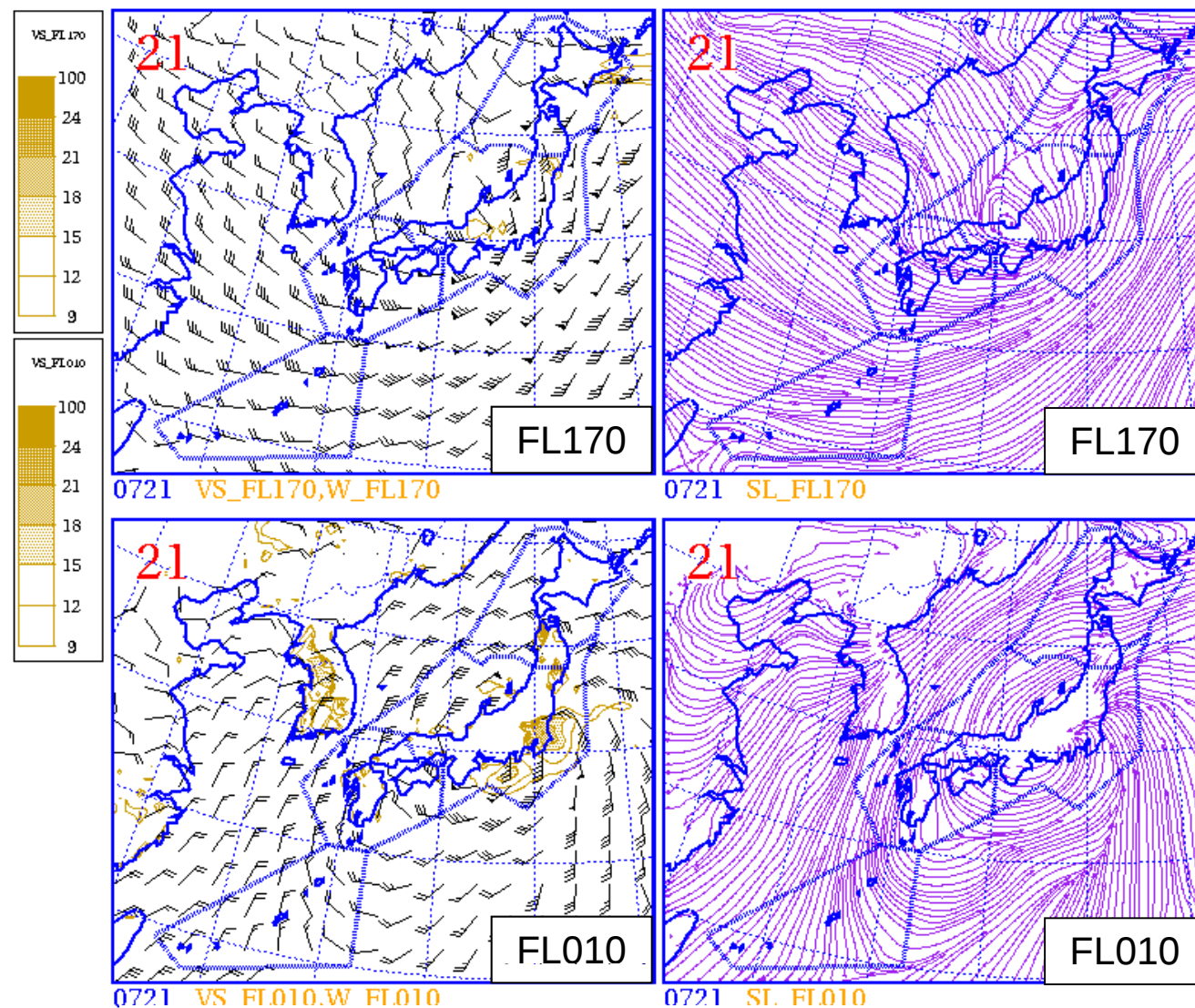
Annual average: 5225m(All), 5181m(No precipitation), 7281m(Precipitation)





Example of the Hourly Analysis

072100OCT2009



06JST 8 OCT 2009

Typhoon 0918

Winds and vertical wind shear

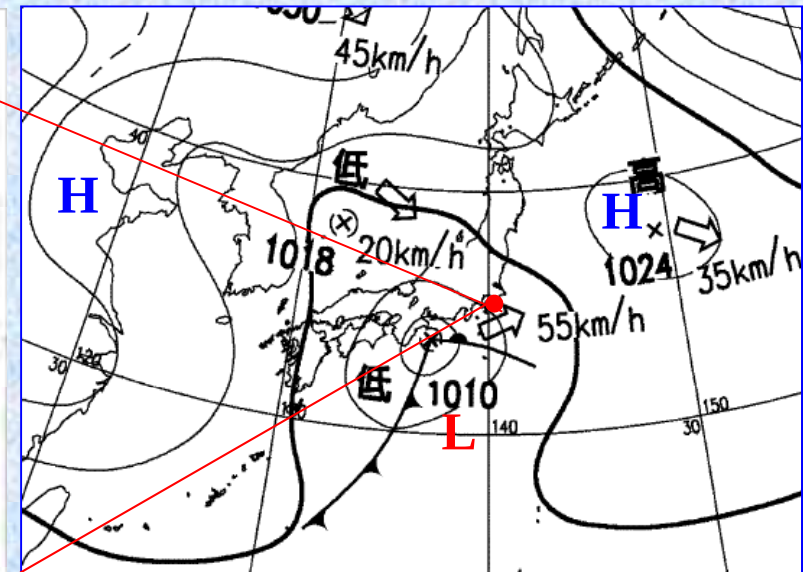
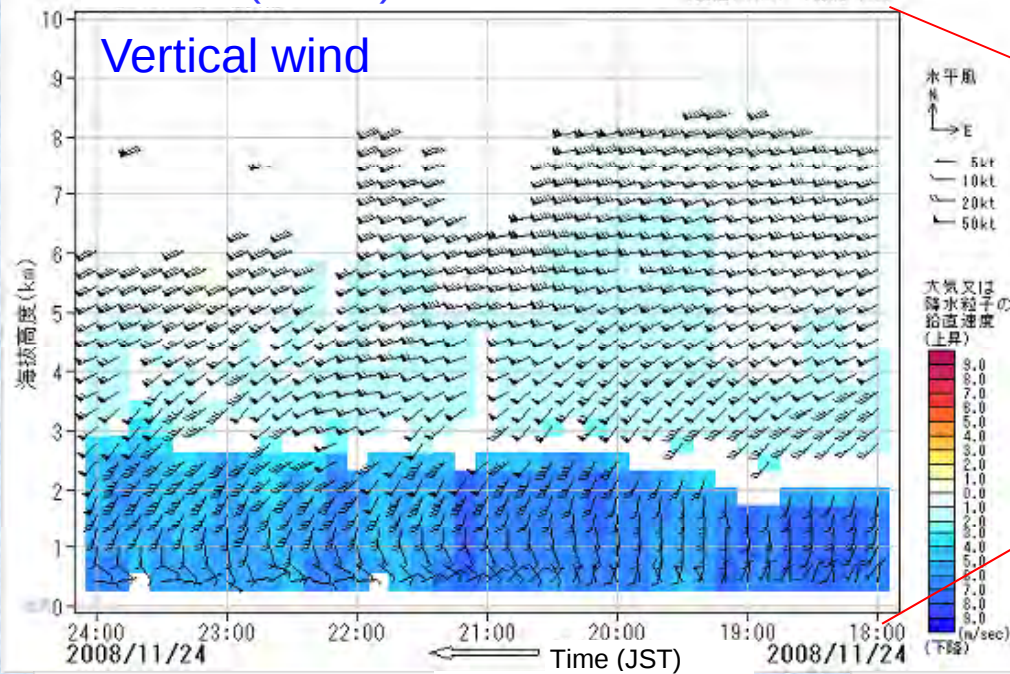
Stream lines



Application to the Weather Analysis

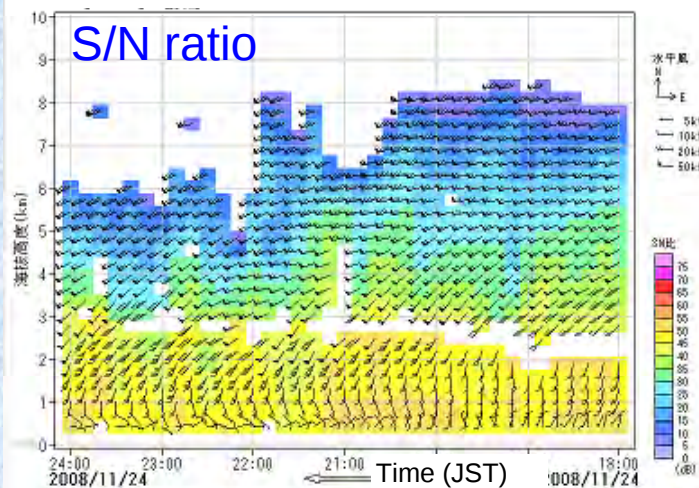
Katuura (47674) 24 NOV 2008

Vertical wind



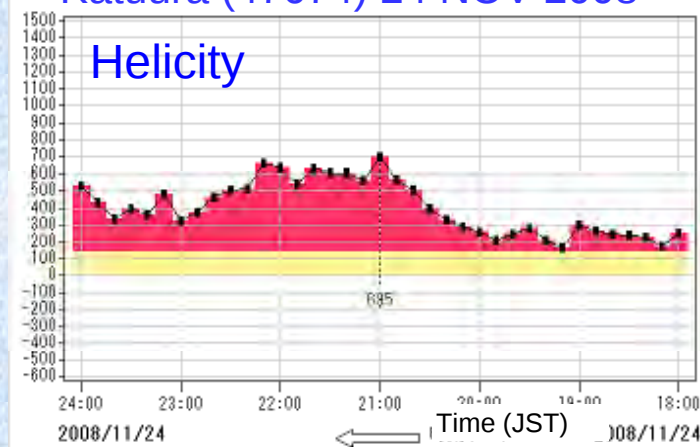
Surface (21LST 24 NOV 2008)

S/N ratio



Katuura (47674) 24 NOV 2008

Helicity



Wind Promoter JMA



Comparison of Upper-Air Wind Observations

	WINDAS	Radiosonde	Doppler radar
Weather condition	All-weather	All-weather	Rainy (snowy) weather
Accuracy (m/s)	<2	<2	<2
Maximum height (km)	3 ~ 9 (depends on weather conditions)	30 ~ 35	15 (depends on weather conditions)
Vertical resolution (km)	0.3	0.3	1 ~ 2
Horizontal spacing (km)	120	190	1
Time between observations (h)	0.17	6 or 12	0.17
Delay in delivery to user (h)	0.3 ~ 1.3	1 ~ 2	0.3 ~ 0.5