

## Measures taken since the accident on the Uetsu Line

On December 25, 2005, the limited express train Inaho No.14 derailed between Sagoshi and Kita-Amarume Stations near the No. 2 Mogami-gawa Bridge. We would like to report on the measures we have taken since this accident.

### Increased number of anemometers (wind meters)

JR East has increased the number of anemometers at the accident site between Sagoshi and Kita-Amarume Stations. In addition, for sections with operational restrictions when there are strong winds, we established multiple anemometers as our new standard and increased the number of anemometers in locations where windbreak fences were installed. By reconfirming the requirements for wind restrictions on sections of railway lines, using information from front-line employees, topography, and wind conditions of the areas, and adding new operation restriction sections, we are working to improve our safety observation network to counter the effects of these strong winds. With this reinforcement, since the accident, JR East has installed a total of 599 anemometers for its conventional and Shinkansen lines, and the total number of anemometers installed as of March 31, 2013 was 916: 758 on conventional lines and 158 on Shinkansen lines.

	As of Dec. 25th, 2005: A	As of Mar. 31st, 2013: B	Increase (B-A)
Conventional lines	228units	758units	+530units
Shinkansen lines	89units	158units	+69units
<b>Total</b>	317units	916units	+599units

### Installation of windbreak fences

In order to reduce wind force on trains, we have installed windbreak fences at the following locations:

<As of Mar. 31, 2013>

	Line Name	Section	Location of Installation	Time Completed
1	Tokaido Main Line	Adjoining Nebukawa Station	Both sides of the line	Jul. 1991
2	Joban Line	Between Yonomori and Ono	West side only	Feb. 1996
3	Kawagoe Line	Between Sashiogi and Minami-Furuya	North side only	Apr. 1998, extended in Jun. 2009
4	Uetsu Main Line	Between Sagoshi and Kita-Amarume	West side only	Nov. 2006
5	Tohoku Main Line	Between Fujita and Kaida	West side only	Nov. 2006
6	Tohoku Main Line	Between Kurihashi and Koga	Both sides of the line	North side: Mar. 2007 South side: Jun. 2007
7	Joban Line	Between Fujishiro and Sanuki	Both sides of the line	Mar. 2007
8	Keiyo Line	Between Kasai Rinkai Koen and Maihama	South side only	Mar. 2007
9	Keiyo Line	Between Ichikawa Shiohama and Futamata Shinmachi	South side only	Mar. 2007
10	Keiyo Line	Between Kaihin Makuhari and Kemigawa-hama	South side only	Mar. 2007
11	Musashino Line	Between Misato and Minami-Nagareyama	Both sides of the line	South side: Mar. 2007 North side: Jun. 2009
12	Keiyo Line	Between Shiomi and Shin-Kiba	Both sides of the line	South side: Jun. 2007 North side: Oct. 2012 South side: Oct. 2012 Extension
13	Keiyo Line	Between Shin-Kiba and Kasai Rinkai Koen	Both sides of the line	South side: Aug. 2007 North side: Oct. 2012 South side extended Oct. 2012
14	Keiyo Line	Between Futamata Shinmachi and Minami-Funabashi	South side only	Aug. 2007, extended Oct. 2012
15	Musashino Line	Between Minami-Koshigaya and Yoshikawa	Both sides on bridge sections North side	Both sides on bridge sections: Mar. 2009 North side: Feb. 2010
16	Musashino Line	Between Kita-Asaka and Nishi-Urawa	Both sides of the line	South side: Dec. 2009 North side: Aug. 2010
17	Uetsu Main Line	Between Atsumi-Onsen and Kobato	West side only	Dec. 2011
18	Uchibo Line	Between Sanukimachi and Kazusa-Minato	West side only	Mar. 2012

### Expanded introduction of a gale warning system

We have been adding to our gale warning system to raise the level of safety by restricting operations not only when the actual wind speed measured by anemometers exceeds restriction thresholds, but also when the projected maximum wind speed exceeds these limits. JR East has installed gale warning systems in all of the 297 locations on its conventional lines with gale operational restrictions.

### Introduction of a method to properly assess the effect of wind force on railcars for operational restrictions

The effect of wind force on railcars is constantly changing. For this reason, JR East has been studying methods to properly assess the effects of wind on railcars and utilize the results to more accurately impose operational restrictions for increased safety in train operations. Together with consideration for the opinions of experts in the field, JR East has been studying the following:

- ① More accurate methods of wind observation using anemometers.
- ② Calculation methods for the yield strength of railcars against wind through considerations for track conditions and car body shape.

JR East introduced these new methods for some sections of the Uetsu Main Line, the Keiyo Line, and the Echigo Line.

### Utilizing meteorological information to test methods for operational restrictions

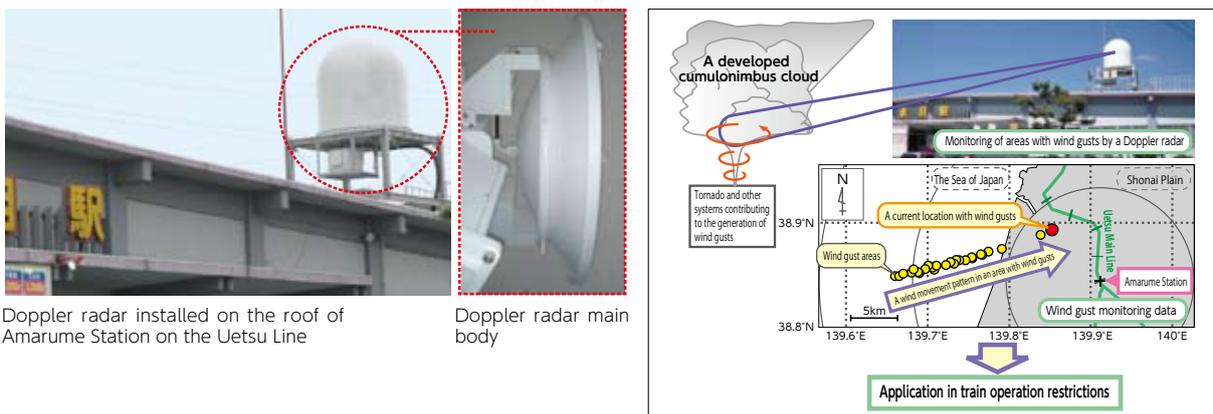
Local gusts are meteorological phenomena, and are difficult to observe with conventional observation equipment such as anemometers. Through meteorological information obtained from the Japan Meteorological Agency radar, and by detecting the passing of cold weather fronts and the accompanying development of cumulonimbus clouds, we have been investigating how to forecast the occurrence of local gusts and to apply that information to our operational restrictions. From FY2008, the system was tested during the winter on the Uetsu Main Line between Niitsu and Sakata and on the Hakushin Line between Niigata and Shibata. On February 17th, 2009, we added the system to sections of the Uetsu Main Line, Shin-etsu Main Line, Echigo Line, Yahiko Line, and Riku-u West Line for additional testing. Additionally from FY2013, we have added the Japan Meteorological Agency's Nowcast that supports detection of tornados as a condition for issuing alarms for our train operations.

During this six year period of testing, though we initiated train operational restrictions for a total of twelve days, we did not observe any actual occurrence of local gusts.

### Research of a Doppler radar observation method

We are currently investigating the possible utilization of a Doppler radar observation method to help identify local gusts, as information to be used for operational restrictions. Doppler radars can determine wind conditions by detecting the movements of raindrops and rain clouds and are used at some airports for detecting local gusts.

Since 2007, we have conducted local gust observations using a Doppler radar. With the system constructed in 2010 as a basis for a local gust detection system, we started real-time local gust detection experiments at Amarume Station on the Uetsu Main Line. While conducting ongoing validations and improvements through experimental monitoring of the local gust detection system, we will advance our research on the application potentiality of the system for train operation restrictions.



Doppler radar installed on the roof of Amarume Station on the Uetsu Line

Doppler radar main body