

Utilization of a Doppler radar for train operation restrictions in the case of local gusts

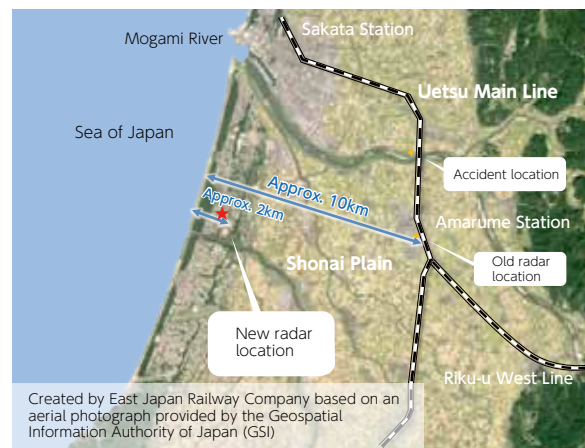
Aiming for further improvement of safety levels for customers' safety and peace of mind

JR East Group sees safety as its top management priority and continues to pursue ultimate safety levels so that customers and people in communities can feel a sense of safety and security. In 2005, a train accident occurred on the Uetsu Main Line between Sagoshi and Kita-Amarume due to local gusts. As one of the countermeasures to prevent such accidents, JR East has been researching how to utilize a Doppler radar for the application of train operation restrictions in the case of local gusts.

Train operation restrictions by utilizing a Doppler radar

When local gusts arise from the Sea of Japan, we detect and track a vortex in the air by using a Doppler radar and stop train operations if the possible route of the local gust is expected to cross train routes. After test observations, the system was introduced for full-scale utilization in Dec. 2017.

For the installation of the fully operational radar, we selected a more appropriate place for observations near the sea where local gusts are generated and the system's performance was improved by providing higher functionality.

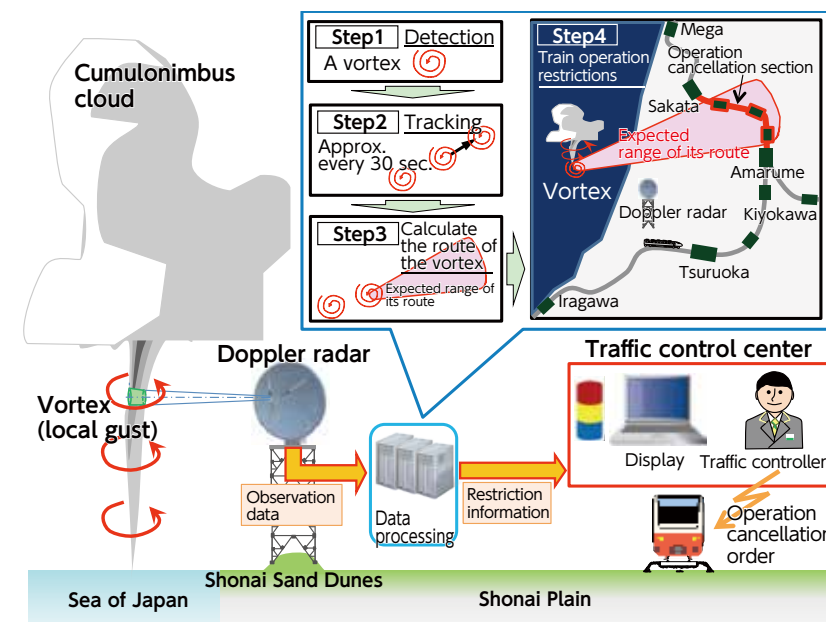


Item	Old radar	New radar
Antenna radius	1.2m	2.0m
Observation range	Radius: 30 km	Radius: 60 km
Distance from sea	Approx. 10 km	Approx. 2 km

Procedures for train operation restrictions

- ① A Doppler radar in Sakata City detects a vortex.
- ② The system tracks the movement of the vortex.
- ③ The system calculates the range of the vortex's expected route.
- ④ When the range of the vortex's route is expected to cross railway lines, the specific section is displayed on the screen at the traffic control center.
- ⑤ The traffic controller instructs trains to stop via train radio.

*The measure is implemented within a 30-km radius of the radar (Uetsu Main Line: between Iragawa and Mega; Riku-u West Line: between Kiyokawa and Amarume).
 *Using this method, train operation restrictions were issued on 16 days (from Dec. 19th, 2017 to March 31st, 2018).

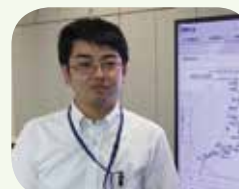


Future development

Besides the conventional measures for train operation restrictions in strong winds, through the above-mentioned additional measure against local gusts we can further heighten the safety levels of our train operations in the Shonai region during winter.

Currently, this method is utilized for train operation restrictions within an approx. 30-km range of the radar. By accumulating data for the radius of 60 km, which is the Doppler radar's maximum potential observation range, we will examine the possibility of expanding the train operation restriction area.

VOICE



Assistant Manager
Disaster Prevention Research
Laboratory
Research & Development Center of
the JR East Group

I am working on the development of methods to implement train operation restrictions during local gusts by utilizing a Doppler radar. When we started to develop the system, we had trouble with it because much was unknown about local gusts from the Sea of Japan during winter. So, based on knowledge about local gusts gained from observation, together with the Meteorological Research Institute of Japan Meteorological Agency, through a process of repeated trial and error we developed appropriate methods for train operation restrictions. I feel that my work is a responsibility, but at the same time it is fulfilling that our development activities contribute to the improvement of safety levels for train operations in the Shonai region.

As I believe that technologies can be advanced by being utilized in society, I will continue to work on improving the accuracy of the detection of local gusts and the expansion of the detection range for train operation restrictions.



Deputy Manager
Niigata Control Operation Center,
Niigata Branch Office

I was assigned to the section in Oct. 2005 and on Dec. 25th of that year, the accident happened. I cannot forget about that accident - the train derailment incident on the Uetsu Main Line. The derailment that caused casualties among the passengers occurred in the railway section that I monitor in traffic control. Even though I was still new to the job, I could understand the graveness of the accident. I feel a sense of inevitability that I am now involved in the development and introduction of this system against local gusts, which were the cause of the derailment. With the aim of fulfilling our promise to the families of those who lost their lives not to allow such an accident due to local gusts to happen again, and also from the standpoint of a traffic controller, we will continue our efforts to further improve the system and protect the safety of our railways as one of the key priorities of the traffic control center.

See p.40-41 for related features.➡