



Characteristics of time series data of wind velocity observed by anemometers when the gust occurred

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In Japan, two railway accidents are caused by F1 gusty wind in 2005 and F2 tornado in 2006. After these accidents, countermeasure against gust disaster became one of the most important tasks for railway companies. In Japanese railway companies, operation control under strong wind is performed for the safety of running trains by using anemometers which are discretely arranged along conventional railway lines. In recent years, high-resolution wind data have been obtained by meteorological Doppler radar. However meteorological Doppler radar can not sufficiently observe wind near the surface of the ground where trains run.

Authors are researching to detect characteristic fluctuations from the wind data obtained by anemometers when the gust occurred, in order to show the relations between wind data at a height of more than 500 m from the ground surface observed by meteorological Doppler radars and wind data at a height of about 5 m from the ground surface observed by anemometers. This paper reports some results.

RTRI observed strong wind at 26 observation sites located in Northern Japan, from October 1st, 2007 to March 31st, 2009. One of gusts occurred on December 2nd 2007, according to the gust database of Japan Meteorological Agency (JMA) is shown. We analyzed the time series data of 1-minute maximum instantaneous wind velocity for approximately 8 hours including the gust occurrence time. The results at 6 observation sites which were located along the direction of the gust traveling are shown. The distances D of these observation sites from the site where the gust occurred was 4.5, 8.4, 11.5, 12.4, 14.5, and 17.2 km. In the time series data obtained at each observation site, there is a fluctuation that has the wind velocity peak for approximately 30 minutes after the gust occurred. The value of wind velocity peak of each observation site tends to decrease with increasing D . Additionally, the spectral analysis results show that the frequency properties of the time series data when the gust occurred vary by the D . Accordingly, authors consider that the wind velocity changes related with gusts could also be detected by anemometers located away from the site where the gusts occurred.

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