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A Study on the development of forecast system for the downstream wind by Hira Oroshi

SAKAMOTO, Hiroto[1]* ; HIGASHI, Kuniaki[1] ; FURUMOTO, Jun-ichi[1] ; HASHIGUCHI, Hiroyuki[1]

[1]Research Institute for Sustainable Humanosphere,Kyoto University

This study aims to develop the precise forecast system of "Hira Oroshi" (hereafter, called as HO), the downstream gust wind blowing down from the Hira mountain range to the West coast of Biwa Lake in Shiga prefecture, Japan. Our system improved the forecast score of gust occurrence to about 80% from 50%.

In this study, the occurrence of downstream gust wind in HO region is defined as the maximum wind speed exceeds to 20 m/s with the wind direction of WEW-NNE.

The intensive observation network was constructed to monitor the detailed behavior of downstream gust and selected four observation points, which can represent the wind field in the whole HO region.

The non-hydrostatic meteorological forecast system with the horizontal resolution of 200 m is constructed by installing WRF (Weather Research and Forecast) to the A-KDK system in Kyoto University. The initial and boundary data is automatically obtained from JMA and other meteorological agencies every six hours. A long-term computational experiment from October 1, 2013 to March 31, 2014 shows very interesting characteristics of wind speed pattern, which appears, only when the gust wind was actually observed.

Narrow strong wind regions extending from the Lake Biwa toward the foot of Hira Mountain range appears and extends to the land in HO region. This structure is used to identify the appearance of gust wind in HO region.

The threshold of strong wind in the forecast model is defined as 14 m/s in this study by considering the model wind velocity represents the averaged wind speed in horizontal grid and integral period. The new method by using this threshold shows very good forecast performance of hit ratio of about 80%.

A performance of time series forecast every three hours was investigated. The forecast predicts longer gust wind period than the actual observation in the whole case. A potential of the precise time series forecast is intensively expected by adjusting the threshold.

This precise meteorological forecast system is based only on general purpose technology and does not adopt heuristics. Therefore, this forecast system is expected to be valid to the regional gust wind every part of the world.

Keywords: gust wind, MesoScale Model, dense observation, boundary layer