Refractivity distributions over the Kanto and Osaka plains and their impacts on the rainfall forecasts

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Temperature and water vapor near the surface play crucial roles in the occurrences of convection cells. However, their variations just before their occurrences still are not completely understood. In this study, the temporal variations of refractivity, which is a function of temperature and water vapor, obtained by the phase data of Doppler radars were investigated. The features of refractivity variations, including the occurrences of convection cells, will be shown in this presentation.

On 19th August 2017, the sea breeze moved inland from the eastern side of the Kanto plain and the refractivity increased along the sea breeze front. These increased regions moved southwestward with the expansion of the cold sea breeze (indicated by arrows in Fig.). The scattered weak rainfall regions appeared all at once when these increased regions passed. It suggests that the occurrences of convection cells might be related to the refractivity variations.

The temporal variation of refractivity on 5th July 2017 was obtained by the Doppler radar of the Kansai-International airport. The local heavy rainfall developed at the Osaka plain from 15JST to 17JST of 5th. The forecast of this local heavy rainfall is expected to be improved by the assimilation of refractivity variations. The refractivity variations were converted to the relative humidity, and were assimilated by using a nested system of Local Ensemble Transform Kalman Filter (Seko et al 2013) by adding them to the JMA’s conventional assimilation data. The impacts of other high density data, such as GNSS-PWV and Doppler velocity of Phased Array Weather Radar of Osaka University, on the local heavy rainfall were also investigated using the same method of refractivity variation (namely, by adding the high density data to the JMA’s conventional assimilation data). In this case, the impact of GNSS-PWV was larger and the GNSS-PWV data weakened the intensity of local heavy rainfall. Although the impact of refractivity variation was smaller, it enhanced the intensity of rainfall slightly.

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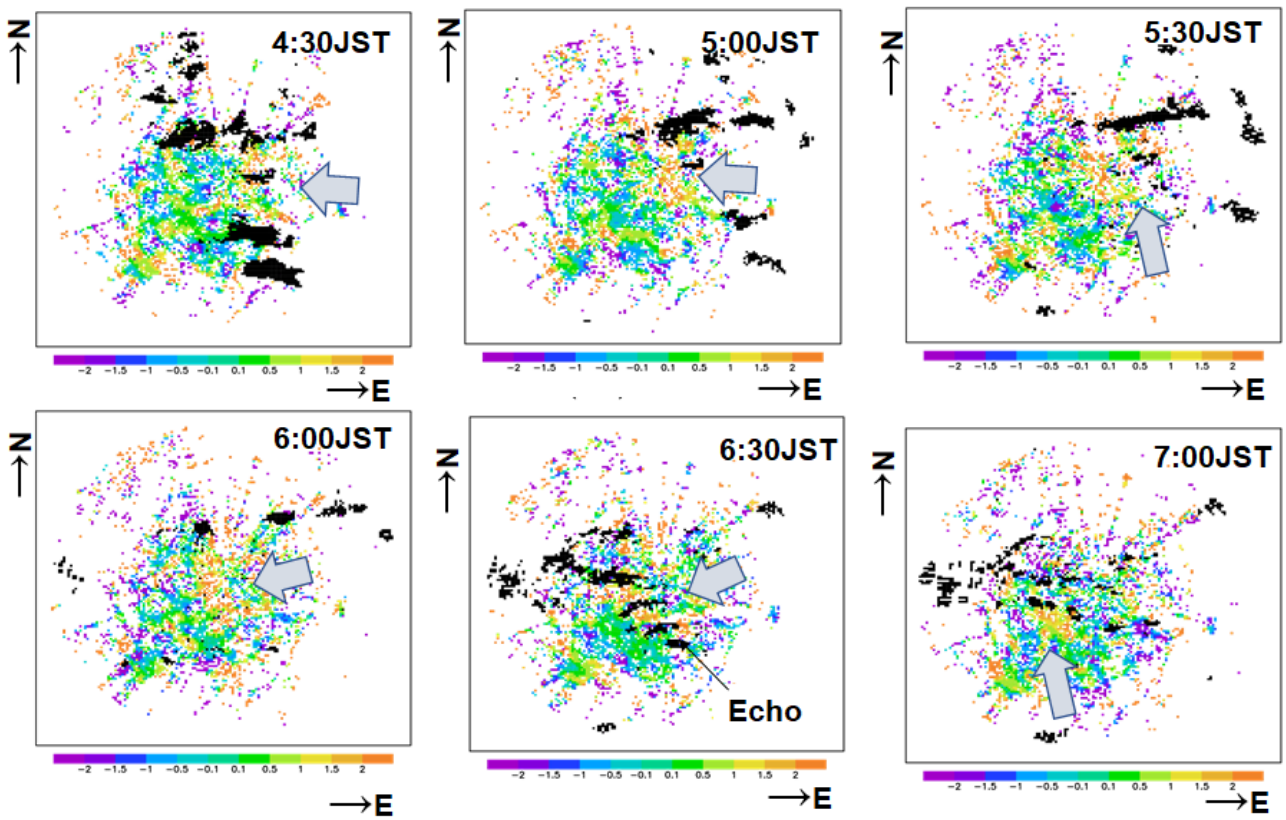

Fig. Temporal variation of phase differences with 10 minute intervals obtained by MRI radar