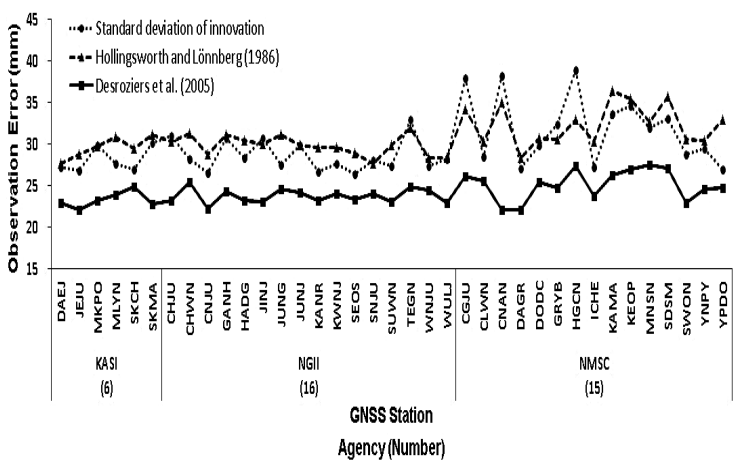
Kim, E.-H., E. Lee, S.-W. Lee, and Y. H. Lee, 2019: Characteristics and effects of ground-based GNSS zenith total delay observation errors in the convective-scale model. *J. Meteor. Soc. Japan*, **97**, http://doi.org/10.2151/jmsj.2019-056.

Plain Language Summary: The ground-based global navigation satellite system (GNSS) data, which provides atmospheric water vapor information in the lower troposphere to the model, affect the accuracy of humidity and precipitation forecast. This study investigates the impacts of the GNSS data observation errors in the KMA's convective-scale model. The observation error of the each ground-based GNSS station was calculated using several *a posteriori* methods and the statistical characteristics were analyzed. The experiment using observation errors applied considering the spatial and temporal characteristics showed the best precipitation accuracy among other experiments.



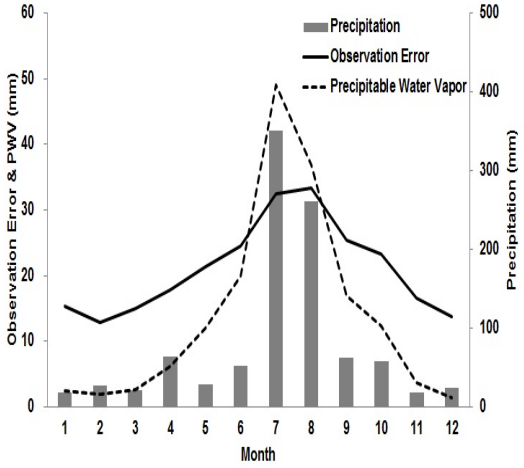


Figure 1 (left). Estimation of observation errors (mm) for ZTD data used in the convective-scale model of KMA for the month of July 2016. The horizontal axis represents each station. The solid, dashed, and dotted line indicates the methods Desroziers et al. (2005), Hollingsworth and Lönnberg (1986), and standard deviation of innovation, respectively.

Figure 2 (right). Monthly means of ZTD observation errors and precipitable water vapors from 40 ground-based GNSS stations and precipitation from the automatic weather station corresponding to each GNSS.

- The ZTD observation errors and precipitable water vapor shows a similar seasonal variation, and the observation error in summer is approximately 2.1 times larger than that in the winter.
- By applying the station-specific error rather than the same error, the improvement rate of the relative humidity is higher in the lower troposphere.
- The quantitative precipitation forecast has been improved in all experiments using GNSS data even though the effects of observation errors are small.