

Impacts of assimilating the typhoon best-track data on the regional reanalysis of the Kanto-Tohoku heavy rainfall in September 2015

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A regional reanalysis system assimilating conventional observations only is under development. We assessed its reproducibility of the extremely heavy rainfall event that occurred in September 2015 over Kanto and Tohoku districts. The impacts of additional assimilation of data related to tropical cyclones (TC) were investigated through observing system experiment.

The regional reanalysis system is composed of the Japan Meteorological Agency's nonhydrostatic model given the Japanese 55-year reanalysis as the lateral boundary conditions and the local ensemble transform Kalman filter assimilating surface pressure observations and upper observations with radiosondes. In this study, we respectively assimilated two types of TC data, specifically positions and pressures of TC centres from the typhoon best-track data and operationally adopted pseudo-observations from TC bogus vortex profiles.

Without assimilating TC data, the heavy rainfall over Kanto and Tohoku was not reproduced due to the insufficient reproduction of the positions and intensities of the associated TCs. The distribution of the rainfall over Tohoku was reasonably described in the experiment assimilating the typhoon best-track data, while it was not adequately reproduced in the experiment assimilating TC bogus data. The bogus vortex profiles are obtained from the typical structure of TCs, which may not be suitable to the TCs that are in transition to extratropical cyclone or have substantially asymmetric structure. For the rainfall over Kanto district, both of the experiments assimilating TC data failed to describe. Large departure between first-guess and actual fields in the position of the TC passing over the ocean to the south of the main island of Japan resulted in erroneous analyses of the TC and transport of water vapour to Kanto district.