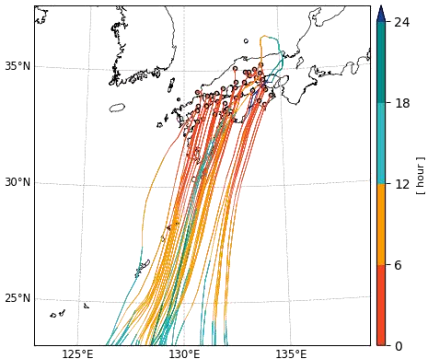
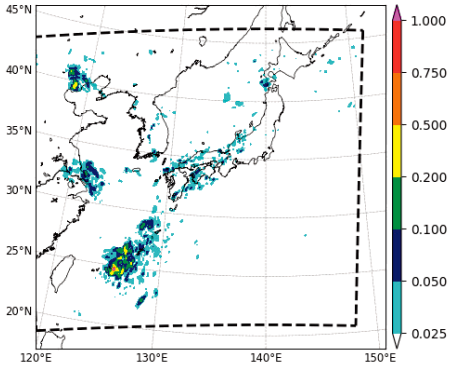
Toyooka, D., T. Kawabata, H.L. Tanaka, 2024: Windward region sensitivity and its effects on heavy rainfall prediction investigated with ensemble systems. *J. Meteor. Soc. Japan*, **102**. https://doi.org/10.2151/jmsj.2024-008.

Plain Language Summary: This study investigates the sensitivity of a heavy rainfall forecast in western Japan in July 2018. To identify the sensitive region, we conducted analyses of a backward trajectory and ensemble sensitivity, which consistently indicate that the moist air mass located windward played an important role in the forecast. Furthermore, observation system experiments show that the precipitation forecast is degraded without windward observations. These findings illustrate that the moist air mass near the Ryukyu Islands was transported by the Western Pacific Subtropical High in the lower troposphere, leading to the heavy rainfall.

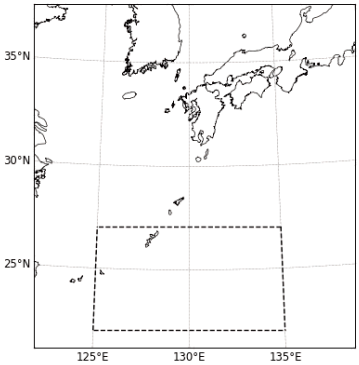
(a) Backward trajectory at 1000 m height



(b) Ensemble sensitivity on zonal velocity



(c) Excluded observation domain



(d) Difference of 12-h accumulated precipitation between DNL and CTRL

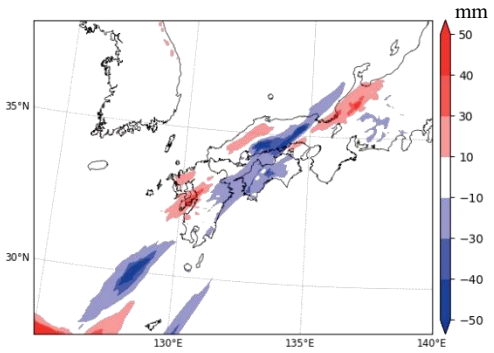


Figure 1. Three kinds of analyses conducted in this study. Backward trajectory from the Setouchi area at 1000 m height for 24-h (a). Ensemble sensitivity but only the component of zonal velocity calculated with the 5-km LETKF (b). Observation system experiment: the domain excluding observational data (dotted box) (c), and the difference of 12-h accumulated precipitation forecasts between DNL (data denial experiment) and CTRL (assimilating all the data) (d).