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2012 年台風ボラヴェンの多重壁雲構造とその風速特性
Multiple Eyewall Structure and its Wind Features in 2012 Typhoon Bolaven

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Typhoon ‘Bolaven’ passed the Okinawa Main Island at about 1200 UTC 26 August 2012, while moving northwestward. The radar images showed that ‘Bolaven’ had the multiple eyewall structure. The surface observation data at Nago of Okinawa showed that the precipitation and surface wind velocity in the typhoon’s central region were weaker than those of the Japan Meteorological Agency (JMA)’s operational forecast.

Cloud-resolving ensemble simulations were performed to investigate the relations between the multiple eyewall structure and the wind features in the typhoon’s central regions. The ensemble simulations reproduced double eyewall structures in several members. To evaluate the reproducibility of multiple eyewall structures, the multi-eye index (MEI) was defined in this study.

Compared with the members in which the typhoon had the spiral rainband structures, the pressure gradients in the typhoon’s central region of the small MEI (multiple eyewall) members were weak. The precipitation and surface wind velocity were also weaker than those of the typhoons with spiral rainbands. In case of the multiple eyewall typhoon, the gentle pressure gradients and the associated weaker surface inflows suppressed convections in the inner eyewall.

The statistical analysis was performed based on the ensemble prediction. A clear positive correlation was indicated between the MEI and the wind velocity (tangential wind and inward radial wind) in the typhoon’s central region. This result explains the reason why the actual wind velocity was weaker than that of the original JMA’s forecast.

The relationship between the atmospheric environmental factors around the typhoon (e.g., level of free convection and convective available potential energy) and MEI was investigated from the outputs of ensemble simulations. The results indicated that there were no strong relations between them. This suggests that the formation of the multiple eyewall structures is not simply determined by the atmospheric environmental parameters but depends on more complicated conditions around the typhoon at the timing of their formation.

Keywords: Ensemble simulation, Typhoon, Multiple eyewall