学 位 論 文 要 旨

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題 目	Seasonal velocity variations over the entire Kuroshio path (黒潮全域における流速の季節変動)

Temporal and spatial variations in the Kuroshio velocity field are important research subjects because they are directly linked to the formation of fishing grounds and variations in fishery resources along the Kuroshio path. The seasonal velocity variation, which is one of the most basic natural variations in the Kuroshio, is a basic theme for the Kuroshio research. Previous studies have reported that the Kuroshio velocity is high in summer and low in winter in some individual regions along the Kuroshio path. However, until now, no studies have investigated the characteristics of seasonal velocity variation in a unified manner over the entire Kuroshio path. In addition, the reason why the Kuroshio velocity is higher in summer and lower in winter has not yet been explained through the conventional theories, and hence it is needed to construct a theory.

Based on this background, this study investigated the seasonal velocity variations over the entire Kuroshio path at several depths based on a systematic method, which mainly consists of observational data analyses, realistic numerical experiments, and theoretical considerations. Based on the observational data analyses, it was found that the seasonal velocity variations above ~500 m depth (upper layer) reach a maximum in July while those variations below ~500 m depth (lower layer) reach a maximum in winter over the broad area of the Kuroshio path. To clarify the essential driving mechanism of these seasonal velocity variations in the Kuroshio, numerical experiments were carried out using a regional model with a realistic coastal and bottom topography. The experiment results showed that the seasonal velocity variation in the upper layer is mainly caused by the local response to the seasonal monsoon wind variation just upon the Kuroshio, while that variation in the lower layer is due to the remote response to the prevailing wind over the western part of the North Pacific Ocean. Focusing on the seasonal velocity variation in the upper layer, an analytical model was used to understand its dynamics. The analytical model underlying the nonlinear Ekman pumping process showed that the shape of the horizontal velocity profile of the Kuroshio has a marked effect on the seasonal velocity variation of the Kuroshio in the upper layer: i.e., for the case that the current width is smaller on the western (onshore) side than on the eastern (offshore) side to the Kuroshio current axis, the velocity of the Kuroshio increases under summer wind condition while decreases under autumn wind condition. This horizontal velocity structure is consistent with the observed structure for the Kuroshio, so that the nonlinear Ekman pumping mechanism is considered to be a new and leading hypothesis to explain the seasonal velocity variation in the upper layer over the entire Kuroshio path.