

Water exchange between the Bohai and Yellow Seas in response to high winds in winter

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Based on the observed data as well as Regional Ocean Modeling Systems (ROMS) diagnostic numerical model, we studied the influence of high wind processes on the circulation and water exchange between the Bohai and Yellow Seas (BYS) in winter. The results show that the vertical structure of the Yellow Sea Warm Current (YSWC) is relatively uniform under condition of high winds, showing obvious barotropic features. However, this flow is not a stable mean flow, showing strong paroxysmal and reciprocating characteristics. A comparison of the changes in sea level suggests that the intensity of the northwards upwind flow is consistent with the abnormal fluctuations in the sea level. It indicates that the upwind flow is closely related to the water exchange between the BYS. The impact of high wind processes on the water exchange between the BYS is enormous. It can make the flux through the Bohai Strait, as well as that through the mouth of each constituent bay (i.e., Liaodong Bay, Bohai Bay, and Laizhou Bay) far greater than usual, resulting in a significant increase in the water exchange rate. The exchange capacity, which is about 8% of the total volume of the Bohai Sea, can be completed in a few days. Therefore, the water exchange of the Bohai Sea may be completed by only a few occasional high wind processes in winter.