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Variability of Circulation and Transports Over the Continental Shelf of the North South China Sea

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A three dimensional ocean circulation model is applied to investigate dynamic variability of seasonal circulation and transports in response to forcing from monsoonal wind stress, Pearl River discharge, lateral flux and tidal forcing over the continental shelf of North South China Sea (NSCS). The model utilizes a high resolution grid (3km horizontal grid size and 30 vertical levels) and realistic coastline and bottom topography. The results show the existence of strong alongshore variability in circulation and across-shelf transport over the shelf, which is found highly correlated with the alongshore variations of coastline and bottom topography. In particular, stronger onshore transports occur in the eastern part of Guangdong coast around 117E and east of Hong Kong during the summer, where width of inner shelf sharply extended offshore. Combined with results from a coupled physical-biological ecosystem model, it demonstrates the corresponding strong onshore transports of cold and high nutrient waters from deeper ocean at the locations. The fresh water input from the Pearl River discharge tends to enhance the across-shelf exchange. Analysis of alongshore momentum balances suggest that negative (westward) pressure gradient force at the downstream of the coastal promontories and at the locations of sharply widen shelf induces stronger onshore currents which advect offshore colder water shoreward. Dynamic rationales of effects from lateral flux invasion and tidal forcing on the circulation and transports will be discussed.