富山トラフ周辺における対馬暖流沿岸・沖合分枝の相互作用の可能性
Possibility of interactions between the coastal and offshore branch of Tsushima Warm Current over the submarine canyon in the Sea of Japan.

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Tsushima warm current (TWC) is known to flow northeastward over continental shelf off the northern coast of Japan. Coastal branch of TWC (CBTWC) is fundamentally current trapped by the coastline, whereas offshore branch of TWC (OBTWC) are interpreted as current steered by continental slope. The coastal line and continental shelf have alongshore discontinuity around the Toyama Trough (TT) which is a submarine canyon cutting across the continental shelf off the downstream side of the Noto Peninsula (NP) and almost reaching the coastline. The CBTWC is observed to change its path from coastal mode to offshore mode when encountering the TT (Igeta et al., 2017). This process results in transformation from the barotropic coastal current into baroclinic jet detached from the coast over the TT. On the other hand, the details of the OBTWC current path change are not well understood, as well as interaction between the CBTWC and OBTWC.
To clarify these, we analyzed re-analysis current data calculated by DR_C (Hirose et al., 2017) that is high resolution nested ocean model. Current paths of CBTWC around the TT were extracted by using current data from 2005 to 2014. The results showed that complete and incomplete current path transition of the CBTWC from coastal mode to offshore mode in 2013 and 2014, respectively. The OBTWC-like current was explicitly confirmed over continental slope just off the current path of the CBTWC over continental shelf around the northern off the NP in 2013, however such current was not able to be found out in 2014. These results suggest that interaction between the CBTWC and the OBTWC makes current path transition of the CBTWC fast.
To interpret these simply, we demonstrated numerical experiment using 2-layered ocean model with simplified continental shelf, continental slope and submarine canyon. Barotropic current trapped by continental slope, modeling the OBTWC, was applied from the upstream boundary. The OBTWC changed its current path from coast to offshore almost in the same manner as the CBTWC over the TT. The detached current over the submarine canyon was re-arrested by the continental slope on the opposite side of the submarine canyon. The OBTWC continued to take its current path in the offshore region after reaching steady state. Once the OBTWC has reached a steady state, the CBTWC was specified at the upstream boundary. The CBTWC flowed along the coast despite the existence of the OBTWC bridging over the TT. Although the CBTWC and OBTWC merged around the northern coast of the NP, they seemed to behave independently. Time scale of the CBTWC current path transition, however, was shorten in the presence of the OBTWC. This indicates the OBTWC let the current path transition of the CBTWC accelerate through vorticity generated around the upstream boundary of the TT. It is considered that vorticity supplied from the OBTWC accelerate eddy growth by the CBTWC that results in current path transition.

キーワード：対馬暖流、流路遷移、流れー流れ相互作用、地形成渦、数値実験
Keywords: Tushima Warm current, current path transition, current-current interaction, topographic eddy, numerucal experiment

