Hypothesis of Dynamics of Water Exchange between the Sea of Okhotsk and the Pacific from a point of view of Tidal Effects

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Island Rule and East Kamchatka Current(EKC) driven mechanism are theories for explaining the exchange system between the Sea of Okhotsk and the Pacific. However, the volume transportation estimated by Island Rule is 1 order greater than observation data by previous reports. Besides, EKC driven mechanism cannot fully explain the situation which is without a significant flow direction either.
Since tidal forcing is also an important component for ocean dynamics, we tested the situation with tidal forcing as a control run. Numerical results from an ocean general circulation model COCO presents that the appearance of tidal effects dominates presence or absence of the net through flow. Further, tidal forcing contributes both barotropic and barolinic components after separating these two components out. The velocity anomaly results show that the western boundary current turns the direction to the island chain when it flows above a sea-mountain in tidal case. Because of the change of flowing direction of the western boundary current, EKC driven mechanism can be established when the friction stress is gained in east side of Island chain. Therefore, we hypothesizes the interaction between western boundary current and tidal forced topographic trapped wave is required in barotropic components exchange system in this model. Besides, the two-channels water exchange system driven by density gradient is also hypothesized for baroclinic component.

Keywords: East Kamchatka Current driven system, topographic trapped wave, eddy-western boundary interaction, density driven exchange

