

Reviewer 1:

General comments: This study employs an idealized model to investigate the topographic modulation on the layered circulation in the South China Sea. The topic should be of interest to those who focus on the circulation dynamics in marginal sea. Overall, I think the authors have illuminated the key physics within the cross-layer interactions over continental slope. Therefore, I just have some suggestions and recommend a minor revision before it is published.

Response: Thanks for the kind suggestions from the reviewer! We carefully revise the manuscript following your suggestions and comments.

Specific comments: 1. Considering that the work is based on an idealized model, I think the authors should present the caveats in their manuscript to help the readers make a correct understanding of the linkage between the theoretical findings and observations or realistic simulations.

**Response:** Thank you for your insightful comment. We fully acknowledge that our study is based on an idealized model, which inherently involves certain simplifications. To address this concern and provide readers with a clear understanding of the linkage between our theoretical findings and observations or realistic simulations, we have revised the manuscript to discuss the caveats of our approach. Specifically, we have highlighted the following points:

**Simplifications in the Model Setup:**

Our model simplifies certain configurations (e.g., boundary conditions, topographic features, and stratification) to focus on the fundamental dynamics of the system. While these simplifications are necessary to isolate key mechanisms, they may not capture the full complexity of real-world conditions. This may limit the quantitative application of our results to specific observational data.

**Extrapolation of Findings:**

The primary goal of our study is to provide theoretical insights into the mechanisms underlying layered circulation and their response to changes in upper-layer motions, rather than to perfectly replicate observed patterns. These insights and understandings have broad applicability in various processes/phenomenon in other regions.

In the revised manuscript we highlighted those point:

Line 120-123: This model simplifies the configurations to focus on the fundamental dynamics of the system. While these simplifications are essential for isolating key

mechanisms, they may not capture the complexity of real-world conditions, potentially limiting its quantitative applicability to realistic processes.

Line 318-323: The primary goal of our study is to provide theoretical insights into the mechanisms driving layered circulation and their response to changes in upper-layer motions. The results underscore the intricate balance between topographical features and oceanic circulation. These insights have broad applicability to understanding similar processes and phenomena in other regions, and help to predict the behavior of marginal sea circulation under varying forcings conditions.

Technical corrections:

1. Eq. (1): the range of integration within the layer should be explicitly written as  $\int_{H_i}^{H_j} dz$

**Response:** Corrected, thanks.

2. L348: the literature is repeated.

**Response:** Corrected, thanks.