黒潮大蛇行を引き起こす傾圧不安定の発達に膠州海山が果たす役割
Effects of Koshu Seamount on the Development of Baroclinic Instability Leading to the Kuroshio Large Meander

*田中 祐希[1]、日比谷 紀之[1]
*Yuki Tanaka[1], Toshiyuki Hibiya[1]

1. 東京大学大学院理学系研究科
1. Graduate School of Science, The University of Tokyo

The Kuroshio south of Japan shows bimodal path fluctuations between the large meander (LM) path and the nonlarge meander (NLM) path. It is well known that the transition from the NLM path to the LM path is triggered by a small meander generated off the southwestern coast of Japan. The small meander first propagates eastward (downstream) along the Kuroshio and thereafter rapidly amplifies over Koshu Seamount located about 200 km to the south of Japan, leading to the formation of the LM path of the Kuroshio. Although it is shown that the existence of Koshu Seamount is essential for the rapid amplification of the small meander, the underlying physical mechanism has not yet been fully understood.

In this study, the effects of Koshu Seamount on this rapid amplification leading to the LM path formation are revisited using a two-layer quasi-geostrophic model that takes into account the effect of bottom topography. Numerical experiments show that the transition processes from the NLM path to the LM path can be successfully reproduced only when the bottom topography mimicking Koshu Seamount is incorporated. In this case, the upper layer meander trough is rapidly amplified through baroclinic interaction with a lower layer anticyclone during their passage over the seamount. A linear stability analysis shows that baroclinic instability over a seamount can be caused by the coupling between the upper layer Rossby wave propagating eastward in the background flow and the lower layer topographically trapped wave propagating clockwise around the seamount. These two waves propagate in the same direction over the northern slope of the seamount so that they can resonantly interact with each other. The wavelength and the spatial structure of this unstable mode are close to those of the numerically reproduced small meander in the early stage of its rapid amplification over the seamount, showing that the baroclinic instability catalyzed by a seamount is an essential process in the formation of the LM path of the Kuroshio.

キーワード：黒潮大蛇行、膠州海山、傾圧不安定、地形性捕捉波、二層準地衡流モデル、線形安定性解析
Keywords: Large Meander of the Kuroshio, Koshu Seamount, Baroclinic Instability, Topographically Trapped Wave, Two-Layer Quasi-Geostrophic Model, Linear Stability Analysis

