The long lasting strong turbulence along the Kuroshio flowing over seamounts in the Tokara Strait

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Flow over the topography is known to induce strong turbulent mixing. Hydraulic jump and internal lee waves are often considered to be causes of the strong turbulence above the topographic features. In contrast, recent high-resolution numerical simulations showed that the negative potential vorticity generation caused by the subinertial geostrophic flow along the bottom slope can induce submesoscale flow instability, followed by microscale irreversible diapycnal turbulent mixing. On the other hand, recent observational results by the authors showed that the bands of strong turbulence associated with the near-inertial internal waves in the Kuroshio flowing over the seamounts in the Tokara Strait. However, due to the lack of sufficient resolutions of the observations, it is still unclear how these near-inertial internal waves are generated, and how the vorticity distributions including that of potential vorticity affect the microscale turbulence. In this study, we found 1000-fold enhancement of turbulent kinetic energy dissipation rates along the Kuroshio over 100 km in the Tokara Strait. The results from the analyses for the in-situ observation data and a nested high-resolution simulation suggest the importance of the vorticity and near-inertial internal waves to maintain this long-lasting strong turbulence along the Kuroshio.

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