

How the Tokara strait cultivates the Kuroshio

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Previous studies have reported clear signs of vigorous turbulent mixing in the Kuroshio due to the presences of shallow and steep topographies in its path (e.g., Hasegawa et al., 2004 and 2008, Chang et al., 2016). Turbulent mixing is one of the most important processes supplying nutrients to the surface euphotic zone from the deep water; however, a quantitative understanding of the turbulent vertical nutrient flux is still limited. On November 2016, we have conducted intensive survey around the Tokara strait by drifting the T/V Kagoshima-maru with the Kuroshio's stream and passed across the shallow (~100 m) sill while deploying a submersible ultraviolet nitrate analyzer (Deep SUNA by Satlantic) attached on a turbulence ocean microstructure profiler (TurboMAP-L by JAC). Occurrence of a flow separation and a hydraulic jump on the sill have been identified from a high resolution velocity survey. The rate of dissipation of kinetic energy reaches $O(10^{-5} \text{ W kg}^{-1})$, and the turbulent vertical nitrate flux reaches $O(1 \text{ mmol m}^{-2} \text{ day}^{-1})$, which is the highest value ever reported for the open ocean.

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