

Strong vertical mixing in the Urup Strait, Kuril Islands

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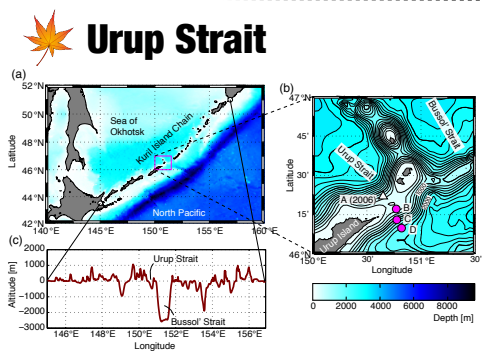


Fig. 1. Geographical characteristics of the study site.

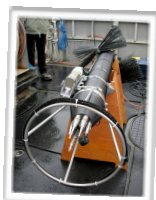
Observation

Research cruises within the Urup Strait in the summer of 2006 and 2007



НИСП "Профессор Хромов"
R/V "Professor Khromov"

1-day continuous microstructure observations were conducted at Sts. A (2006: Δ) and B-D (2007: \bullet) (See Fig. 1)

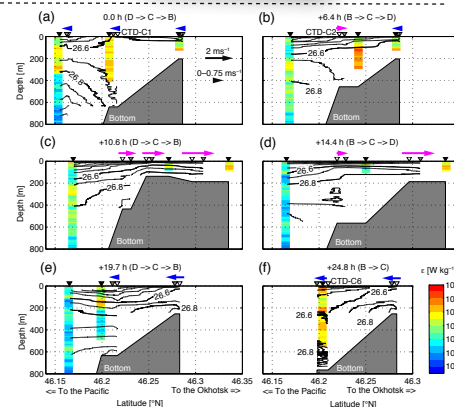


Vertical Microstructure Profiler (VMP500)

Mixing intensity

- ▶ Very strong turbulence ($\epsilon > 10^{-5} \text{ W kg}^{-1} / K\phi > 5000 \text{ m}^2 \text{ s}^{-1}$)
- ▶ Homogeneous layer with a thickness of 300–600 m on the slope
- ▶ Strongest turbulence occurred mainly during periods of down-sill flows

Fig. 2. Surface velocity, potential density and energy dissipation rate during the 1-day observation



Estimation of diapycnal volume transport

1-D density balance on an isopycnal surface (McDougall, 1984)

$$w_d \frac{\partial \sigma_\theta}{\partial z_d} = - \frac{\partial}{\partial z_d} \overline{w_d' \sigma_\theta'} = - \frac{\rho_0 \Gamma}{g} \frac{\partial \epsilon}{\partial z_d} \quad (1)$$

Diapycnal velocity is calculated as:

$$\langle w_d \rangle = - \frac{\rho_0 \Gamma}{g} \left\langle \frac{\partial \epsilon}{\partial \sigma_\theta} \right\rangle \quad (2)$$

- ▶ Mean ϵ took a peak between 26.6–26.7 σ_θ , indicating the injection of diapycnal flows to this layer
- ▶ Possible contribution to southward intrusion of intermediate water into the subtropical gyre

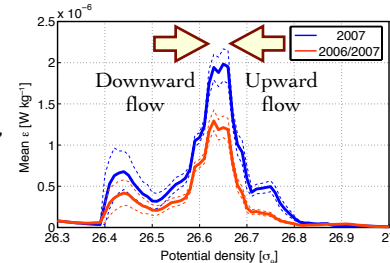


Fig. 3. Mean turbulent energy dissipation rate ϵ [W kg^{-1}]

Reference

Itoh, S. et al., *JGR*, **115**, doi:10.1029/2009JC005629, 2010 / Itoh, S. et al., *GRL*, **38**, doi:10.1029/2011GL048507, 2011

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