Near-inertial shear and widespread intensified thermocline mixing in a seasonally stratified shelf sea

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Mixing within and across the thermocline in seasonally stratified shelf seas controls nutrients supply from depth, laying the foundation for the growth and distribution of primary producers. Thermocline mixing is nevertheless suppressed by the strong stratification, as a result of which nutrients are usually depleted in the euphotic zone, substantially limiting new productivity. Here we show for the first time that there is widespread intensified thermocline mixing in the summer stratified Yellow Sea with the average thermocline dissipation rate and vertical eddy diffusivity to be 2.2×10^{-7}W $kg^{-1}$and $4.4\times10^{-5}m^2s^{-1}$, respectively. Analysis of mooring and shipboard velocity measurements reveals the presence of energetic downward-propagating near-inertial waves. These waves appeared to have induced strong velocity shear across the thermocline, which generated the observed intensified thermocline turbulence. These results have important implications for nutrients cycling and the maintenance of primary productivity in seasonally stratified shelf seas.

