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An Experimental Study of Turbulence Behind Towed Biplanar Grids in a Salt-Stratified Fluid

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ABSTRACT

Biplanar grids were towed down a 30 m long tank of stratified water at 10–60 cm s⁻¹. Stratifications from $N=0.2$ to 0.5 rad s⁻¹ were used. Single electrode conductivity probes repeatedly profiled the decaying turbulence at selected distance behind the towed grid. Reynolds numbers ranged from 5000 to 48 000 and grid Froude numbers ranged from 4 to 70. For short decay times ($t < 0.5$ Väisälä-Brunt period) gradient fluctuation spectra showed a shape similar to a Batchelor viscous-convective subrange. Dyed wakes showed a pronounced collapse after 0.5 Väisälä-Brunt period. At longer times, spectra changed shape, with high-wavenumber contributions dropping rapidly and having form similar to those seen in oceanic vertical microstructure data. After 4–6 Väisälä-Brunt periods, gradient fluctuations essentially disappeared, and highly structured internal waves remained for several minutes to hours.

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