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Effects of stratification on an ocean surface Ekman layer HIEU PHAM, SUTANU SARKAR, UC San Diego — Large-eddy simulations are used to investigate the effects of stratification on structural and turbulent dynamics of an upper-ocean Ekman layer that is driven by a constant wind stress (friction velocity u^*) at low latitude with Coriolis parameter f. The surface layer evolves in the presence of interior stratification whose buoyancy frequency varies among cases, taking three values: $N/f = 19, 60$ and 192. At quasi-steady state, a stratified turbulent Ekman layer forms with a surface current veering to the right of the wind direction. The thickness of the Ekman layer decreases with increasing N and is found to scale with u^*, f, and N, similar to the neutral atmospheric boundary layer of Zilitinkevich & Esau (2002) that is capped by a stratified layer with buoyancy frequency, N. As N increases, the speed of the Ekman current increases but the Ekman transport is invariant. The surface veering angle also increases with larger N. The shear rate and buoyancy frequency are elevated at the base of the Ekman layer. The peak of down-wind Reynolds stress occurs near the surface and scales with u^{*2} in all cases while the peak of cross-wind Reynolds stress occurs in the middle of the Ekman layer and decreases with increasing N.

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