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Experimental study of the SGS pressure-strain-rate correlation in the convective atmospheric surface layer[1] KHUONG NGUYEN, CHENNING TONG, Clemson University — The subgrid-scale (SGS) stress and flux are studied using measurement data obtained in the atmospheric surface layer during the Advection Horizontal Array Turbulence Study (AHATS) field program, which notably includes measurement of the resolvable- and subgrid-scale pressure. We analyze the terms in the transport equations of the SGS stress and SGS heat flux, conditioned on the resolvable-scale velocity, for different filter scales and atmospheric stability. The results show that the pressure destruction terms in the budgets of the SGS shear stress and the SGS heat flux play the usual role of return-to-isotropy and generally counter the trends of the conditional production for all filter scales and unstable conditions. In contrast, the pressure-strain-rate correlations in the budgets of the normal SGS stress components can be the main cause of anisotropy of the SGS stress under convective conditions, depending strongly on the resolvable-scale velocity. These effects are most significant at large filter scales and have strong implications for modeling the near-wall SGS pressure-strain-rate correlation.

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