



Geometric Alignments of the SGS Force in the Atmospheric Surface Layer

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A priori tests of subgrid-scale (SGS) parameterizations in Large Eddy Simulation (LES) often rely on comparisons between the SGS stress and filtered strain rate tensors even though these tensors are not directly used in LES. Rather, the Divergence of the SGS stress, the so-called SGS force, is the parameterized quantity. We compute the SGS force from field data and compare with parameterizations using a geometric approach. The analysis is based on a field campaign (July, 2002) using arrays of sixteen sonic anemometers deployed at the Surface Layer Turbulence and Environmental Science Test (SLTEST) facility in the Utah West Desert to spatially resolve the full SGS scale stress tensor and its parameterizations. We observe that the SGS force is preferentially aligned with the divergence of the strain rate tensor as well as the Leonard term. However, in both cases there is significant anti-alignment between these vectors. This anti-alignment is shown to be associated with negative dissipation, or energy backscatter.