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Modeling The Divergence Of The Two-Point, Third-Order Velocity Correlation[1] AMITABH BHATTACHARYA, ICES, University of Texas, Austin, ROBERT MOSER, ICES and Mech. Engr., The University of Texas, Austin — Knowledge of $\Gamma_{ij}(\mathbf{x},\mathbf{r}) = \partial\langle \mathbf{u_i'}(\mathbf{x})\mathbf{u_k'}(\mathbf{x})\mathbf{u_j'}(\mathbf{x}+\mathbf{r})\rangle/\partial \mathbf{r_k}$ is crucial for modeling the subgrid force using the Optimal LES approach (Langford and Moser, (1999)). Here, a method is developed to obtain an approximation to Γ_{ij} in statistically stationary turbulence, given a finite-dimensional representation for $R_{ij}(\mathbf{x},\mathbf{r}) = \langle \mathbf{u_i'}(\mathbf{x})\mathbf{u_j'}(\mathbf{x}+\mathbf{r})\rangle$. The rotationally invariant representation of R_{ij} is in terms of Structure Tensors (Kassinos, 2001), and accounts for componental and directional anisotropy. Our method is based on the fact that the evolution equation for R_{ij} is $DR_{ij}/Dt = F_{ij}(\Gamma_{ij}, \Pi_{ij}, R_{ij}, G_{ij})$, where $\Pi_{ij}(\mathbf{x},\mathbf{r})$ is the two-point pressure-strain correlation and G_{ij} is the mean velocity gradient. For $DR_{ij}/Dt = 0$, a symmetrized form of Γ_{ij} can be obtained in terms of a production term involving R_{ij} and G_{ij} (after projecting out Π_{ij} using continuity). The resulting model and it's underlying assumptions are validated by comparison with DNS.

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