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**Subgrid Scale (SGS) Flow Structures and Energy Flux in a Rough-wall Channel Flow**[1] JOSEPH KATZ, JIARONG HONG, CHARLES MENEVEAU, Johns Hopkins University, MICHAEL SCHULTZ, United States Naval Academy — This study examines interactions among turbulence structures of different scales based on high resolution PIV data obtained in a rough-wall channel flow, with $\delta/k$=50 ($k$ is roughness height), $k_s^+$=90-150 and Reynolds numbers of $Re_\tau$=3520-5360. Top-hat spatial filtering with filter length scale of $\Delta$=1$k$, 3$k$, 6$k$ divide the turbulence to roughness, intermediate and large scale motions, respectively. The SGS energy flux increases substantially with length scale and decreasing distance from the wall, especially in the roughness sublayer. The latter persist even when this flux is scaled with the local TKE production rate, which also peaks near the wall. Dissipation of energy is particularly high in the 1-3$k$ range everywhere, especially in the roughness sublayer. Non-local transport, i.e. direct energy flux from large to roughness scales, which circumvents the typical cascading process, also increases rapidly near the wall. Conditional sampling indicates that this non-local flux is associated with inclined large scale shear layers (coherent structures) residing in the outer part of the boundary layer, which as our earlier data indicate, transport roughness scale turbulence to the outer layer.

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