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A Minimal Flow Unit of the Logarithmic Layer in the Absence of Near-Wall Eddies and Large Scales[1] HYUNJI JANE BAE, Caltech, ADRIAN LOZANO-DURAN, Stanford University — The observation that the buffer and viscous layers of wall-bounded flows can be simulated in periodic boxes of minimal dimensions has been useful in understanding wall turbulence since it enables the study of individual flow features in isolation from their mutual interactions. In this talk, we present and discuss a flow configuration that isolates a portion of the log layer by limiting the formation of larger outer-layer structures while suppressing the formation of the near-wall eddies. We achieve this by applying the Robin boundary condition in a minimal flow unit tailored for the log region. This method, in addition to isolating the log-layer eddies, can utilize the scale separation in the entirety of the domain such that large-eddy simulation (LES) can be performed without the restrictive grid-resolution requirements near the wall for no-slip walls. We perform direct numerical simulation and LES of the proposed setup to demonstrate that the log-layer structures can be isolated using one-point statistics and energy spectra.

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