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The large-scale wall-to-wall interaction in fully developed turbulent channel flow YONG SEOK KWON, KAPIL CHAUHAN, CHARITHA DE SILVA, JASON MONTY, NICHOLAS HUTCHINS, The University of Melbourne — The geometry and boundary conditions in a turbulent channel flow ensure symmetry or anti-symmetry of the time-averaged turbulence statistics across the channel half-height ($y = h$). These statistics are conventionally studied over one half of the channel. However instantaneous fluctuating velocity fields often show coherent large-scale anti-symmetric features on either side of the centreline. This talk will present the interaction of such large-scale events with the turbulence originating on the opposite wall. Particle Image Velocimetry (PIV) is utilized to obtain two-component flow fields across the full channel height for $Re_\tau = hu_\tau/\nu \simeq 1000 - 4000$. Ensemble averages of fluctuating velocity fields conditioned on clockwise and counter-clockwise swirl events at reference wall-normal positions ranging from $y = 0.1h$ to $y = h$ reveal the presence of the wall-to-wall interaction of large-scale motions. Further results from conditional averaging such as fluctuating velocity contour plots and vector fields will be presented to show this wall-to-wall interaction in channel flow. A decomposition of flow fields into symmetric and anti-symmetric components shows that the anti-symmetry predominantly exists for very large-scale motions (VLSMs) of the order $10h$.

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