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**Structural organization of large and very-large scales in turbulent pipe flow simulation**[1] JON BALTZER, RONALD ADRIAN, Arizona State University, XIAOHUA WU, Royal Military College of Canada — The physical structures of velocity are examined in a recent DNS of fully developed incompressible turbulent pipe flow at $Re_D = 24\,580$ ($R^+ = 684.8$) with a periodic domain length of 30 pipe radii $R$ (Wu, Baltzer, & Adrian, J. Fluid Mech., 2012). In this simulation, the long motions of negative velocity fluctuation correspond to large fractions of energy present at very long streamwise wavelengths ($\geq 3R$). We study how long motions are composed of smaller motions. We characterize the spatial arrangements of very large scale motions (VLSMs) and find that they possess dominant helix angles (azimuthal inclinations relative to streamwise) that are revealed by 2D and 3D two-point spatial correlations of velocity. The correlations also reveal that the shorter, large scale motions (LSMs) that concatenate to comprise the VLSMs are themselves more streamwise aligned. We show that the largest VLSMs possess a form similar to roll cells and that they appear to play an important role in organizing the flow, while smaller scales of motion are necessary to create the strong streaks of velocity fluctuation that characterize the flow.

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