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DNS study of very-long coherent structures in turbulent pipe flow RONALD ADRIAN, Arizona State University, XIAOHUA WU, Royal Military College of Canada, JON BALTZER, Arizona State University — Fully developed incompressible turbulent pipe flow at Reynolds number $Re_D = 24,580$ is simulated with second-order finite differences on a streamwise-periodic, 536 million point grid. The Karman number $R^+ = 648.8$, and the computational domain length is $30R$. The mean, second-order statistics and two-point correlations agree well with published experimental data. Pre-multiplied power spectra of the streamwise velocity peak at two wave numbers, one corresponding to very large scale motions (VLSM) 3–$15R$ long, and the other corresponding to large scale motions (LSM) less than $3R$ long, consistent with earlier work (Kim and Adrian, Phys. Fluids **2**, 417–422, 1999, *et seq.*). The low speed patterns of VLS motion convect at the bulk velocity, and they are associated with strong, radially inward ejections from layers closer to the wall. They are made up of smaller structures having spacings of $\sim 0.2R = 125^+$ or less, coinciding with the typical spacing between hairpins in a near wall packet. The VLS motions also appear to leave a clear low-speed pattern in the near wall regions.

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