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**The dynamics of relaminarization in turbulent pipe flow** KENNETH BALL, ANDREW DUGGLEBY, MARK PAUL, Virginia Polytechnic Institute and State University — Propagating structures, based upon a Karhunen-Loève decomposition, undergoing reverse transition from turbulent to laminar flow are investigated. The turbulent flow is generated by a direct numerical simulation starting at a fully turbulent Reynolds number of $\mathrm{Re}_\tau = 150$, and is slowly decreased until $Re_\tau = 95$. At this low Reynolds number the high frequency modes decay first, leaving only the slower decaying streamwise vortices. The flow undergoes a chugging phenomena, where it begins to relaminarize and increase its mean velocity. The remaining propagating modes then destabilize the streamwise vortices, rebuild the energy spectra, and eventually the flow regains its turbulent state. A simulation capturing three chugging cycles before the flow completely relaminarizes is presented. The high frequency modes present in the outer layer decay first, establishing the importance of the outer region in the self-sustaining mechanism of wall bound turbulence.

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