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Dynamics of Streak and Roll Structures in Turbulent Plane Couette Flow DENNICE GAYME, Johns Hopkins University, BRIAN FARRELL, Harvard University, PETROS IOANNOU, University of Athens, BINH LIEU, MIHAILO JOVANOVIC, University of Minnesota — The dominance of streamwise elongated features in transition and turbulence motivates the use of streamwise constant (so called 2D/3C) and statistical mean state dynamics models to investigate the dynamics of the well studied streamwise elongated roll and streak structures in plane Couette flow. Predictions resulting from two such theoretical models are compared to those of fully resolved DNS data. The 2D/3C model correctly captures the roll/streak structures, the momentum transfer mechanism and statistical features of turbulence such as the mean turbulent velocity profile. Furthermore, the statistical mean state dynamics model, which couples the streamwise constant mean flow and (streamwise varying) perturbation dynamics, adds the critical feedback mechanism arising from the important $k_x \neq 0$ information to this streamwise constant framework. The resulting model not only predicts the roll/streak structures, mean profile and momentum transfer but also exhibits a bifurcation from the stable 2D/3C dynamics to a self-sustaining turbulent state that closely resembles that seen in DNS. **Acknowledgements:** This research was performed at the 2012 Stanford CTR Summer Program.

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