1060-76-7 **Lennaert van Veen*** (lennaert.vanveen@uoit.ca), 2000 Simcoe Street North, Oshawa, Ontario L1H 7K4, Canada, and **Genta Kawahara** (kawahara@me.es.osaka-u.ac.jp) and **Atsushi Matsumura** (atsushi324@mbox.me.es.osaka-u.ac.jp). *The tangled edge of turbulence in bursting Couette flow.* Preliminary report.

In recent years, the scale of dynamical systems-type computations in turbulence research has increased spectacularly. Equilibrium and periodic solutions have been computed for Couette flow, pipe flow and many other geometries. One of the goals of these computations is to explain the process of turbulent bursting in shear flows. Bursting occurs in the presence of an asymptotically stable laminar flow, so that ordinary bifurcation scenarios do not offer an explanation. Instead, the current focus is on "edge states," i.e. saddle-type equilibria or periodic solutions that live on a boundary between turbulent and laminar behaviour. We should be able to clarify the bursting process if we know the geometry of the (un)stable manifolds of such states. However, the systematic computation of these manifolds is a hard task. We present a recently developed algorithm for the computation of unstable manifolds and its application to turbulent Couette flow. This algorithm uses matrix-free linear solving and comes with a strong convergence result. Initial computations indicate that the (un)stable manifolds of an edge state in turbulent Couette flow form a homoclinic tangle, an observation with far-reaching implications for our understanding of the transition to turbulence. (Received December 31, 2009)