1035-65-1652 **Leon Kaganovskiy*** (lkaganovskiy@ncf.edu), 3505 Cheshire Sq, apt B, Sarasota, FL 34237, and **Robert Krasny** (krasny@umich.edu). *ADAPTIVE PANEL METHOD FOR PARTICLE SIMULATION OF THREE DIMENSIONAL VORTEX SHEET MOTION.*

We present a new local, adaptive, higher order, tree-based quadrature and point insertion method to describe 3-D vortex sheet motion. The main new contribution is a hierarchical tree representation of the vortex sheet surface, which allows us to insert new computational particles locally as leaves of the tree as opposed to the insertion of a complete new filament as in the previous approach. We have also developed 4th order accurate integration, point insertion, and derivative calculation schemes, compared to the 2nd order schemes available before. It appears that at the later stages of computation when the mesh becomes less smooth, the lower order methods perform better. In addition, we have developed a new curvature-based point insertion scheme. The method has been applied to the motion of vortex rings which are modelled as rolled-up vortex sheets. It has allowed us for the first time to resolve the long time details of the Widnall instability of a single vortex ring and collision of two rings, including the development of complicated nonlinear regions with hairpins and many layers of roll-up. (Received September 20, 2007)