Abstract Submitted
for the APR09 Meeting of
The American Physical Society

Dust Devil Dynamics[1] WENDELL HORTON, CYNTHIA CORREA, Institute for Fusion Studies, University of Texas at Austin, HIDEAKI MIURA, Department of Simulation Science, National Institute of Fusion Science, Japan, BRUCE RODENBORN, Institute for Fusion Studies, University of Texas at Austin, INSTITUTE FOR FUSION STUDIES, UNIVERSITY OF TEXAS AT AUSTIN TEAM, DEPARTMENT OF SIMULATION SCIENCE, NATIONAL INSTITUTE OF FUSION SCIENCE, JAPAN TEAM — The theory and simulation tools of fusion plasma physics are used to describe the dynamics of dust devils. The Grad-Shafranov equation governs the poloidal flow stream function and gives a class of solutions for steady axisymmetric flows. The high core velocity is limited by viscous dissipation with a modified Burger's vortex model. Since the Reynolds number is not large, these structures are well represented on vector computers in contrast to collisionless plasmas. Electrically charged sand grains ($10 - 100\mu m$) are integrated as passively convected by the winds and results in vertical electric fields that assist the vortices in lifting materials off the ground and into the vortex. The rotating charged dust produces a magnetic field. Thus, some of the important properties of high temperature plasmas are manifested in these common, small scale coherent structures.

[1]The authors benefited from useful discussions with Atsushi Ito, Tomo-Hiko Watanabe, Ahki Ishizawa and Ken Uzawa. Research supported by the National Institute for Fusion Studies, Japan and the National Science Foundation through ATM-0638480 at UT Austin

Cynthia Correa
Institute for Fusion Studies, University of Texas at Austin

Date submitted: 13 Jan 2009 Electronic form version 1.4