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Nonlinear Dynamics of Alfven-Vortex Current Loops[1] CYNTHIA CORREA, WENDELL HORTON, Insitute of Fusion Studies, University of Texas at Austin, XIANGRONG FU, SWADESH MAHAJAN, Institute for Fusion Studies, University of Texas at Austin, HIDEAKI MIURA, Department of Simulation Science, National Institute of Fusion Science, Japan, INSTITUTE FOR FUSION STUDIES, UNIVERSITY OF TEXAS AT AUSTIN TEAM, DEPARTMENT OF SIMULATION SCIENCE, NATIONAL INSTITUTE OF FUSION SCIENCE, JAPAN TEAM — Solar corona-photosphere and magnetosphere-ionosphere observations (HINODE and CLUSTER) show well-defined dynamics ($\mathbf{v} = \hat{\mathbf{z}} \times \nabla\phi$) of current-carrying Alfven-vortex flux tubes $d\psi$. Using theory and simulations we investigate the nonlinear dynamics and heating rates that may be expected from electron Landau damping of kinetic Alfven waves launched by oscillating photospheric current loops and convective instabilities from inverted electron density-temperature gradients. Computer experiments on vortex dynamical alignment and the generation of zonal flows and zonal magnetic fields are carried out. Theoretical generalizations of the Rossby wave-drift wave vortex solutions are given and explored numerically.

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