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Investigation of Chaotic Fluctuations in a Linear Helicon Plasma under Changing Magnetic Field and Radial Electric Field[1] SHUANGWEI XIE, MARK GILMORE, CHRISTOPHER WATTS, TIFFANY HAYES, LINCAN YAN, University of New Mexico — Experiments conducted in a linear helicon plasma (HelCat) device show evidence of deterministic chaos in edge fluctuations under DC biasing on a set of concentric rings which terminate the plasma column. At low bias or without bias, a low frequency coherent instability is present in the density gradient region, consistent with a resistive drift mode. At higher bias, there is an increase in azimuthal flow and flow shear, and a new instability is observed which could be a Kelvin-Helmholtz instability or interchange mode. Additionally, a parallel forward flow (away from the source) at the plasma center and backward flow at the plasma edge are observed. This return sheared flow may be an inflow due to increased radial fluctuation-induced transport at the plasma edge, and may play a role in the chaotic dynamics. Increasing magnetic field also affects these instabilities and their nonlinear dynamics. Experimental results and two fluid modeling are presented.

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