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Pattern formation and filamentation in low-pressure, low-temperature magnetized plasmas: A descriptive model[1] MOHAMAD MENATI, UWE KONOPKA, EDWARD THOMAS, Auburn University — Self-organization is a commonly observed phenomenon in a wide variety of plasma systems. One of the most recent examples of this phenomenon is the observation of filamentary structures and their associated pattern formation in low-pressure capacitively coupled rf glow discharged plasmas that are exposed to high magnetic fields. We define 'filamentary structure' as distinct, localized regions within a plasma that appears brighter than the surrounding plasma and that extend parallel to the magnetic field lines. Despite several experimental investigations of the phenomenon, the underlying physics that describes the initial formation and long persistence (up to several seconds) of the filaments remains poorly understood. In this presentation, a model is presented to describe self-organization in magnetized plasmas based on the results from 3D numerical simulations that self-consistently solve the plasma fluid equations along with the Poisson's equation. The formation of these structures is thought to be mainly due to discrepancy between the fluxes of electrons and ions across and parallel to the magnetic field. Additional evidence is presented that suggests that filament formation is also affected by plasma-surface interactions at the boundaries of the plasma.

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