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Numerical Investigation of Synthetic Buoyancy-Induced Columnar Vortices[1] NICHOLAS MALAYA, ROY STOGNER, ROBERT MOSER, University of Texas at Austin — Much of the solar energy incident on the Earths surface is absorbed into the ground, which in turn heats the air layer above the surface. This buoyant air layer contains considerable gravitational potential energy. The energy can drive the formation of columnar vortices (Dust-Devils) which arise naturally in the atmosphere. These Dust-Devils occur over a wide range of scales in many different locations across the Earth, as well as on Mars. A new energy harvesting approach makes use of this ubiquitous process by creating and anchoring the vortices artificially and extracting energy from them. In this talk we explore the characteristics of these vorticies through numerical simulation. Computational models of the turning vane system used to generate the vortex have been developed. We will discuss the formulation of these models and their validation against available experimental measurements. We will also describe the use of these simulations to optimize the turning vane configuration to maximize the power extraction, as well as serving as a vehicle to probe the dynamics of the underlying physical processes. Finally, this talk will conclude with comparisons between the synthetic vorticies and the naturally occurring phenomena.

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Nicholas Malaya
University of Texas at Austin

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