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Constant- flux discrete heating in a unit aspect-ratio annulus JUAN M. LOPEZ, Arizona State University, SANKAR MANI, East Point College of Engineering and Technology, YOUNGHAE DO, Kyungpook National University, FRANCISCO MARQUES, Univ. Politècnica de Catalunya — Natural convection in an annulus with a discrete heat source on the inner cylinder is studied numerically. The outer cylinder is isothermally cooled at a fixed low temperature, and the top wall, the bottom wall and unheated portions of the inner cylinder are thermally insulated. For low applied heat flux through the heater, as measured non-dimensionally by a Grashof number, Gr, the flow in the annular gap consists of a weak single-cell overturning meridional flow and heat is transported primarily via conduction. As the nonlinear convection terms become more important, the meridional circulation sweeps the isotherms from being almost vertical near the outer cylinder to almost horizontal near the bottom wall. By the end of the transition from the conductiondominated regime ($Gr < 10^4$) to the convection-dominated regime ($Gr \sim 10^6$), the flow becomes segregated into three distinct regions and there is a strong wall plume originating at the heater that reaches the top and forms a large scale wavy structure along the top. For $Gr \sim 10^{10}$, this wavy structure becomes unstable to 3D instability with high azimuthal wavenumbers $m \sim 30$.

Francisco Marques
Univ. Politècnica de Catalunya

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