Abstract Submitted
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Instability of laterally heated cylindrical convection[1] DE-JUN SUN, BO-FU WANG, University of Science and Technology of China — The three dimensional instabilities of axisymmetric flow in a vertical cylinder partially heated from the sidewall are explored. The cylindrical wall is heated in a central zone and is insulated above and below this zone, while both ends of the cylinder are cooled. The length of the heated zone equals to the cylinder radius. The dependence of the critical Rayleigh number on the Prandtl number is obtained for three fixed values of aspect ratio, A=1.92, 2, 2.1 (A=height/radius). The Prandtl number ranges from 0.02 to 6.7. The instability curve for A=1.92 is monotonous. The instability curves for A=2 and A=2.1 are non-monotonous and contain hysteresis, particularly, an instability island is found for A=2. The flow is oscillatory unstable at small Prandtl number due to hydrodynamic instability. At medium Prandtl number, the interaction of buoyancy and shear of base flow lead to the instability results. The Rayleigh-Benard instability is dominant at large Prandtl number, and the flow loses stability through a steady bifurcation.

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