Abstract Submitted
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Optimal 2D convection cooling flows SILAS ALBEN, Univ of Michigan - Ann Arbor — We generalize a recent method for computing optimal 2D convection cooling flows in a horizontal layer to a wide range of geometries, including those relevant for technological applications. We write the problem in a conformal pair of coordinates which are the pure conduction temperature and its harmonic conjugate. We find optimal flows for cooling a cylinder in an annular domain, a hot plate embedded in a cold surface, and a channel with hot interior and cold exterior. With a kinetic energy constraint, the optimal flows consist of vortices ranging in size from the length of the hot surface to a small cutoff length at the interface of the hot and cold surfaces. With a constraint on input power (fixed rate of viscous dissipation), the optimal flows are dominated by large-scale vortices, with the same size as the flow domain.

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