Couple stress Rayleigh-Bénard convection in a square cavity

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Highlights:

- Consistent couple stress theory is extended to Boussinesq thermal convection problem
- Momentum balance involves a new length scale parameter and fourth order derivatives
- Fluid element bending provides an additional energy dissipation mechanism
- Critical Rayleigh number for square cavity becomes size dependent at small scales
- Moment traction versus vorticity boundary conditions significantly affect stability