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Thermal convection of a fluid with temperature-dependent viscosity

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Numerical analysis has been made for two-dimensional Be´nard convection of a fluid with temperature-dependent viscosity of exponential type based on the Boussinesque approximation. The stress-free surface condition and periodic structure in the horizontal direction were assumed, where the horizontal length of periodicity was chosen to be twice of the depth. Parameters characterizing the flow are the Rayleigh number Ra0, the Prandtl number Pr0, and the log viscosity ratio c, i.e., the logarithm of the ratio of viscosities at the upper and the lower boundaries. Solutions of the stationary states were obtained for Ra0=3000 and 1600. For both of the values Ra0=3000 and 1600, two stationary solutions were found for c≥8 and c≥10, respectively, namely the system has a multi-valued nature.