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Abstract

Turbulent diffusivities are often used for representing nonlinear interactions of turbulent elements on the motion of a larger scale. In turbulent convection, the average life of a representative element is substantially lengthened by buoyancy. Taking this effect into account, we calculate turbulent viscosities, thermal and electrical conductivities for Boussinesq fluids on the basis of a spectral theory of turbulent convection (Nakano, Fukushima, Unno, and Kondo, 1979). The effect of buoyancy results in the increase of turbulent diffusivities, compared with the case without buoyancy. We also propose the generalization of the method such that a stellar convection zone can be theoretically constructed without recourse to the mixing length.

Reference

Nakano, T., Fukushima, T., Unno, W., and Kondo, M. 1979, *Publ. Astron. Soc. Japan*, 31, 713.