Simulations of convective layer of the Sun using the $k\varepsilon$ model

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Convective layer in the solar atmosphere was numerically simulated with 1D ERA code [1]. Empirical kε model of turbulence [2] was used. Contrary to widely used in astrophysics the mean length theory (MLT), the kε model in a unified way describes convective processes for different scenarios (gravitational and shear instabilities, convection and semiconvection, overshooting) and conditions (stable evolutionary and unstable explosive) and can be realized in multidimensional codes [3]. We compared numerical results with obtained using the MLT model and experimental helioseismic data on depth of solar convective layer.

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References:
1. N.A. Barysheva, A.I. Zuev, N.G. Karlykhanov *et al*., ZhVMMF, 22, 401 (1982).
2. M.I. Avramenko. About kε model of turbulence. Preprint RFNC-VNIITF, 2005
3. V.A. Simonenko, D.A. Gryaznykh, N.G. Karlykhanov, V.A. Lykov, A.N.Shushlebin. Astronomy Letters, 33, 80–92 (2007)