Steffen, M.; **Freytag, B.**
Rotating 'star-in-a-box' experiments. (English) Zbl 1255.85029
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Summary: Using the radiation hydrodynamics code CO^{5}BOLD in its 'star-in-a-box' setup, we have performed exploratory simulations of global convection in a rotating reference frame. The goal is to study the interaction of convection and rotation by direct numerical simulation. For these first experiments, we chose an idealized configuration (a scaled-down, fast rotating Sun) whose properties resemble those of red supergiants in some respect. We describe the setup and time evolution of these models, and discuss the particular problems we have encountered. Finally, we derive the resulting differential rotation pattern and meridional flow field by temporal and azimuthal averaging of the simulation data. We find anti-solar differential rotation for all cases studied so far.

MSC:

85A30 Hydrodynamic and hydromagnetic problems in astronomy and astrophysics
85A15 Galactic and stellar structure
76M25 Other numerical methods (fluid mechanics) (MSC2010)
76R10 Free convection
76U05 General theory of rotating fluids

Keywords:

convection; hydrodynamics; radiative transfer; stars: rotation; supergiants

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