Examining the Impact of Prandtl Number and Heat Transport Models on Convective Amplitudes

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Turbulent motions within the solar convection zone play a central role in the generation and maintenance of the Sun's magnetic field. This magnetic field reverses its polarity every 11 years and serves as the source of powerful space weather events, such as solar flares and coronal mass ejections, which can directly affect artificial satellites and power grids. The structure and inductive properties are linked to the amplitude (i.e speed) of convective motion. Using the NASA Pleiades supercomputer, a 3D fluids code simulates these processes by evolving the Navier-Stokes equations in time and under an anelastic constraint. These codes imitate the fluxes describing heat transport in the sun. The theories behind the radiative, entropy, and kinetic energy flux have been well established, yet past models simulating the conductive and granulation fluxes have not produced results matching observations from the sun. New models implement a revised granulation flux at the sun's surface. Results comparing the behavior of convection with and without the new model will be presented, as well as the behavior of convection with a varying prandtl number.