

First comprehensive calculation of the sun from the base of the convection zone to the lower chromosphere

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We carry out a comprehensive calculation from the base of the convection zone to the lower chromosphere of the sun for the first time.

The solar convection zone is stratified significantly. The density at the base of the convection zone is one million times larger than that at the photosphere (surface). This causes significant spatial and temporal scale separations between these regions. For example, the time scales are minutes and month at the base and the surface, respectively. We thus need to investigate these region separately so far.

In terms of the sunspot creation, however, it is inevitable to cover the whole convection zone in one calculation, since strong magnetic field for the sunspots is thought to be generated around the base of the convection zone by dynamo action and the sunspots are emerged with radiative cooling at the surface. For years, we carefully prepare methods for covering the whole convection zone, the reduced speed of sound technique, the equation of state, the radiation transfer and so on. Finally, we succeed in covering the whole convection zone in a calculation. We report method and results of this state-of-the-art calculation in the presentation.

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