[구SE-03] Non-grey Radiative Transfer in the Solar Surface Convection

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Combining a detailed non-grey radiative transfer computation with the three dimensional hydrodynamics, we investigate a reliable numerical scheme for turbulent convection in the solar surface. The solar photosphere is the extremely turbulent region composed of partly ionized compressible gases in high temperature. Especially, the super adiabatic layer (SAL) near the solar photosphere is the shallow transition region where the energy transport varies steeply from convection to radiation. In order to describe physical processes accurately, a detailed treatment of radiative transfer should be considered as well as the high resolution computation of fluid dynamics. For a direct computation of radiation fields, the Accelerated Lambda Iteration (ALI) methods have been applied to hydrodynamical medium, incorporating the Opacity Distribution Function (ODF) as a realistic schemes for non-grey problems. Computational domain is the rectangular box of dimensions 42× 3 Mm with the resolution of 1202× 190 meshed grids, which covers several granules horizontally and 8 ~ 9 pressure scale heights vertically. During several convective turn-over times, the 3-D snapshots have been compiled with a second order accuracy. In addition, our radiation-hydrodynamical computation has been compared with the classical approximations such as grey atmospheres and Eddington approximation.

[구SE-04] U-loop emergence on the Sun

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In this talk we explain U-loop emergence, in which U-shaped field lines emerge into the solar surface against gravitational force. In principle, they hardly emerge because mass tends to accumulate at the bottom of U-loops, thereby decreasing buoyancy. A key is found to be the shape of U-loops, that is, if U-loops have a shallow dip whose depth is of the order of the photospheric gravitational scale height, then a diverging flow is generated via a siphon-like mechanism by which the mass accumulated at the dip of the loops is drained out to enhance buoyancy. This successfully makes U-part of the loops emerge against gravity. We also discuss the relation between U-loop emergence and the so-called flux cancellation observed on the Sun in which opposite polarity regions apparently approach together and disappear.