

Role of magneto-convection from the point of view of large-scale magnetic structure formation on the solar surface

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The roles of magneto-convection on the solar surface in the formation of large scale magnetic field, which are revealed by the recent observation, are reported in this presentation.

Many energetic activities on the solar surface, e.g. filament formation, solar jet, and slow solar wind etc., root in the large-scale magnetic configurations. The circumstances around the photosphere, e.g. actual visible surface, is at high plasma beta condition. So the magnetic field is transported mainly by the surface convection there. Simultaneously its configuration is significantly affected and changed from its birth to solar surface. Hence, understanding of magneto-convection on the solar surface is thought to be a basic but an important issue in the solar physics for long time.

Despite of its importance, it is very difficult to give the conclusion to roles of solar surface convection to global structure, namely to answer how does it transport magnetic field and how does it change states of magnetic field. The difficulties come from the smallness and short time scale of the element structures of magneto-convection on the solar surface (<1,000km and order of minutes). The first difficulty is its smallness and short time scale in absolute value. We need stable high spatial and temporal resolution to catch up their element structure. We can say this difficulty is nearly solved thanks to the recent satellite observation. However, there is the second difficulty, smallness and short time scale compared to large scale structure (~700,000km and order of years). We need a new method of analysis to overcome the problem, huge scale difference.

To solve this problem, we develop auto-recognition and tracking method of patches and apply it to the actual data. In the presentation, we report the results about reformation of patch structures by surface convection, especially the frequency distribution of flux content in each patch structure. We find that it is re-formed in 30 minutes, which is much shorter than flux supply time scale. This result indicates that most magnetic structures on the solar surface is decided by the local convection nature.

Keywords: the Sun, magnetic field, convection