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Fragmented Magnetic Features Subject to Magnetoconvection in an Emerging Flux Region on the Sun Observed by Hinode

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The solar photosphere is a special region in that it gives a plenty amount of information on solar active phenomena via radiation. By observing this region, we can see the behavior of solar plasma on the surface, which is related to the subsurface process that cannot be detected directly via radiation. In this talk we report a result showing the spatial distribution of magnetic field in an emerging flux region observed by Hinode, with a focus on its relation to the subsurface structure of magnetic field. We found that fragmented magnetic features appeared in the emerging flux region, which provides us the information on the subsurface structure of magnetic field that is subject to magnetoconvection. In order to obtain the relation between the subsurface magnetic structure and the magnetic structure observed on the surface, we compared the observations with the magnetohydrodynamic (MHD) simulations that reproduce the emergence of magnetic field into the surface, investigating how twisted subsurface magnetic field produces a particular surface distribution of magnetic field. The combination of observations and simulations gives an insight into the relation between the subsurface structure of magnetic field and the distribution of magnetic field observed on the Sun, which leads toward a deep understanding of how the nature of observed activity depends on the subsurface magnetic structure.