Properties of transient horizontal magnetic fields and their implication to the origin of the quiet-Sun magnetism

Ryohko Ishikawa *(National Astronomical Observatory of Japan)*

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Recent spectropolarimetric observations with high spatial resolution and high polarization sensitivity have provided us with new insight to better understand the quiet-Sun magnetism. This talk is concerned with the ubiquitous transient horizontal magnetic fields in the quiet-Sun, as revealed by the Solar Optical Telescope (SOT) on board Hinode satellite. These horizontal magnetic fields are smaller than the granules, and transient with the lifetime of 1-10 min. The field strength of these magnetic fields is essentially smaller than the equi-paritition field strength corresponding to the granular convective motions. The properties of these magnetic fields are common between the quiet and weak plage regions. These observational consequences would suggest that the local dynamo process driven by the granular convective motions generates these horizontal magnetic fields. Furthermore, the continuous observations from the space enable us to study the relationship between these small-scale magnetic fields and large-scale convections such as the meso- and supergranulations, and lead us to discuss the origin of the quiet Sun magnetism as a whole. We also estimate the magnetic energy flux carried by these horizontal magnetic fields based on the statistical data, and find that the total magnetic energy is comparable to the total chromospheric and coronal energy loss. This enhances the importance of the magnetic fields measurements in the chromosphere.