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# On the properties and the origin of transient horizontal magnetic fields observed with Hinode

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The SOT spectropolarimeter on board Hinode reveal that there are ubiquitous horizontally inclined magnetic fields with strengths of a few hundred G in the internetwork regions (e.g., Lites et al. 2008). The sizes of the horizontal magnetic fields are smaller than the size of the granule where they appear and the lifetime of the horizontal magnetic fields ranges from 1 to 10 minutes with the mean lifetime of about 4 minuets. The movie obtained with Hinode shows that these horizontal magnetic fields are highly frequent and transient, and the term transient horizontal magnetic fields (THMFs) is used for them (Ishikawa et al. 2008). These THMFs are observed in the quiet Sun as well as in the plage region. There are granular-sized horizontal fields in the polar regions, and these magnetic fields may be the same as THMFs (Tsuneta et al. 2008; Ito et al. 200 9).

Spectro-polarimetric observations with the Solar Optical Telescope (SOT) are analyzed to compare the properties of THMFs in both plage and quiet Sun regions near solar disc center. The distributions of magnetic field strengths are remarkably similar. A majority of the THMFs have field strengths smaller than the equipartition field strength for average local convective flow. The occurrence rate in plage is the same as that in the quiet Sun, while the vertical magnetic flux in the plage region is 8 times larger than in the quiet Sun. There is essentially no preferred azimuth orientation for all THMFs in either region. These similarities suggest that a common local dynamo process generates THMFs all over the sun. However, THMFs in the plage region selected for their higher degree of linear polarization appear to have preferred direction which is consistent with that of the plage-region's large-scale vertical field pattern. This may suggest that the THMFs are influenced by the larger-scale magnetic field pattern of the plage. It is also reported that the energy flux carried by THMFs is comparable to the total chromospheric and coronal energy loss in both quiet and plage regions, assuming that all the THMFs reach above the photosphere. These unique properties of THMFs are presented.

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