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Hinode observations on current carrying magnetic loops responsible for solar explosive phenomena

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Hinode observations show that explosive phenomena with large variery of magnitude and morphology, including jets, microfares, and flares, occur in the solar corona and chromosphere. One of research targets in space weather researches is to predict the occurrence of solar flares, which cause major impacts to the space environment. For the purpose, it is important to understand the basic mechanisms on storing the energy in magnetic field and triggering explosive events. One of key observations is to precisely measure the physical conditions, especially, magnetic field, at the site of explosive events. The solar optical telescope (SOT) onboard Hinode has been for the first time providing the precise measurements of magnetic field vectors with high spatial resolution, although the magnetic field can be measured only in a thin layer at the photosphere. The measured magnetic field vectors give the spatial distribution of vertical electric current density, which is key observational information for identifying where twisted magnetic flux is formed on the photosphere.

In this presentation, we discuss high resolution magnetic field observations of a sunspot light bridge which produced chromospheric plasma ejections intermittently and recurrently for almost two days. The observations reveals obliquely oriented magnetic fields with strong electric current along the light bridge, suggesting that current-carrying highly-twisted magnetic flux

tubes are trapped below a cusp-shaped magnetic structure along the light bridge. A bi-directional jet was clearly captured, suggesting magnetic reconnections occuring at the very low altitude. Moreover, we found another strong vertical electric current on the interface between the carrent-carrying flux

tube and pre-existing umbral field, which might be a direction detection of the currents flowing in the current sheet formed at the magnetic reconnection sites. The observations provide the information for understanding magnetic field configuration and physical condition preferable for causing explosive events.