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# Precise measurements of magnetic fields in the solar chromosphere for coronal field modeling

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It is critically important to understand mechanisms of accumulation and release of magnetic energies in solar coronae responsible for a solar flare and its impact to the space weather. A strong tool to study it is magnetic field extrapolation based on nonlinear force-free modeling. For reliable modeling of coronal magnetic fields, it's essential to employ boundary condition based on measurements of magnetic field vectors on the solar surface provided with spectro-polarimetric observations. Photospheric magnetic fields are now routinely available with ground-based and space-based observatories such as SOLIS, Hinode, and SDO. But plasma beta in the solar photosphere is larger than unity, which does not guarantee the force-free condition and makes it difficult to get reliable extrapolation using the photospheric magnetic fields as the boundary condition. One possible approach to resolve the issue is to use magnetic field information in the chromosphere where plasma beta is comparable with or smaller than unity. But the chromospheric fields are generally weaker than the photospheric ones, and it is still hard to obtain reliable magnetic field vectors in the solar chromosphere.

We performed a campaign observation to get thermo-dynamical and magnetic field properties in the solar chromosphere using Facility Infrared Spectropolarimeter (FIRS) and Interferometric BIdimensional Spectrometer (IBIS) at the Dunn Solar Telescope (DST) of the National Solar Observatory in United States. Hinode Solar Optical Telescope (SOT) also joined in this campaign, and provided precise magnetic field data in the photosphere. The primary objective of this campaign is to identify super-sonic flows in the chromosphere around a sunspot, and to investigate how the flow velocities are related with magnetic field configuration and plasma condition. We observed a well-developed sunspot in an active region 11330 from 25 Oct to 31 Oct in 2012. We successfully obtained good spectro-polarimetric data for diagnostics of chromospheric fields simultaneous with high cadence filtergram data for studying chromospheric dynamics. We are now trying to retrieve magnetic field vectors from the polarimetric data using the Zeeman and the Hanle effect. We are going to report our progress of the data analysis in the campaign observation.

Keywords: the Sun, chromospheric magnetic field, polarization measurement, coronal magnetic field