[구SE-07] Doppler Shifts of the Hα Line and the Ca II 854.2 nm Line in a Quiet Region of the Sun Observed with the FISS/NST

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The characteristics of Doppler shifts in a quiet region of the Sun are investigated by comparing between the Hα line and the Caii infrared line at 854.2 nm. A small area of 1 6′′× 40′′ was observed for about half an hour with the Fast Imaging Solar Spectrograph (FISS) of the 1.6 meter New Solar Telescope (NST) at Big Bear Solar Observatory. The observed area contains a network region and an internetwork region, and identified in the network region are Hα fibrils, Caii fibrils and bright points. We infer the Doppler velocity from each line profile at a point with the lambdameter method as a function of half wavelength separation $\Delta\lambda$. It is confirmed that the bisector of the spatially-averaged Caii line profile has an inverse C-shape of with a significant peak redshift of +1.8 km/s. In contrast, the bisector of the spatially-averaged Hα line profile has a different shape; it is almost vertically straight or, if not, has a C-shape with a small peak blueshift of −0.5 km/s. In both the lines, the bisectors of bright network points are much different from those of other features in that they are significantly redshifted not only at the line centers, but also at the wings. We also find that the spatio-temporal fluctuation of Doppler shift inferred from the Caii line is correlated with those of the Hα line. The strongest correlation occurs in the internework region, and when the inner wings rather than the line centers are used to determine Doppler shift. In this region, the RMS value of Doppler shift fluctuation is the largest at the line center, and monotonically decreases with $\Delta\lambda$. We discuss the physical implications of our results on the formation of the Hα line and Caii 854.2 nm line in the quiet region chromosphere.

[구SE-08] A Solar Cyclone with Chromospheric Running Wave

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An innovative solar observing satellite, Hinode, has successfully observed the detailed evolution of a rapidly developing emerging flux region from the beginning of its appearance at the solar surface. The high spatial and temporal resolution provided by the satellite enables to capture the prominent dynamic processes such as the rotational motion of a polarity region with intense magnetic flux which is reminiscent of a cyclone on the Earth, and a running wave that spreads ahead of this rotating polarity region. This 'solar cyclone' is, on the other hand, generated differently from terrestrial cyclones, and a possible generating mechanism for it is demonstrated with a three-dimensional magnetohydrodynamic simulation of a twisted magnetic flux tube emerging from the solar interior into the solar atmosphere. The simulation shows that the rotational motion is caused by a strong downflow of plasma along the twisted field lines that form a helical pillar standing upright on the Sun.