Title2:

How does the solar wind originate from the quiet-Sun region?

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Short title: Origins of SW in QS

List of instruments and spacecraft:

XRT/HINODE, SOT/HINODE, EIS/HINODE, SUMER/SOHO

Science Objective:

Hassler et al. (1999, Science, 283, 810) took Ne VIII blue-shift as the proxy of solar wind outflow in the quiet-Sun. He et al. (2007, A&A, 468, 307) found that Ne VIII blue-shifts do not coincide well with the open field lines, most of which pass through the coronal dark regions. Therefore Ne VIII blue-shift may not be the proxy of solar wind outflow in the quiet-Sun. It is needed to search for an alternative proxy in the hotter emission lines, e.g. Fe X or Fe XII, for which EIS is ready to help us to fulfill the task of searching proper proxy of solar wind outflow in the quiet-Sun region.

Mover, Ne VIII blue-shifts in the quiet-Sun are suggested to be related with the mass supply to the large-scale coronal loop [He et al. 2007, A&A, 468, 307; Tian et al. 2007, A&A, accepted]. Tian et al. (2007, A&A, accepted) reported an example of both upward flow at two legs of the coronal loop, which implies a possible expansion of the coronal loop resulting from the simultaneous clockwise or anti-clockwise twisting at the two legs [Amari, et al., 1999, ApJ, 518, L57]. The magnetic field twisting driven by photospheric convection is thought to be essential for coronal heating and initial plasma acceleration through the transition region magnetic reconnection [Buchner et al., 2004, ESA-SP-575; Buchner & Nikutowski, 2005, 2005soho., 16E., 21B]. Such magnetic field twisting may be caused by the circular motion of magnetic in-element around the network intersection [Zhang et al., 1997, A&A, 1998, 335, 341]. Therefore, the horizontal velocity field on the photosphere is important for understanding the mass transportation to the corona, coronal heating, and solar wind origin in the quiet-Sun. Magnetograms of high spatial resolution and high cadence obtained from SOT is responsible for the evolution of photospheric boundary conditions.

Target:

The instruments are operated to pointed at a quiet-Sun region with an area of about 250”x300”. The imaging or scanning lasts for about 3 hours and 30 minutes.

Request to instruments:

Request to SUMER:

Slit: 300”x1”

X=250”; 1” steps

Exposure time: 50 sec

Duration: 210 min

Spectral window: 1380~1420 Ǻ (950 spectral-pixels), which contains various distinguishable lines formed over a wide range of temperatures, e.g. S I (1396.11 Ǻ, 1409.3 Ǻ, 1385.51 Ǻ), Ni II (1.2x10^4 K, 1411.07 Ǻ), Fe II (1.2x10^4 K, 1387.22 Ǻ , 1418.85 Ǻ), Si IV (7.9x10^4 K, 1393.78

Å, 1402.77 Å), and O IV (1.6x10^5 K, 1399.77 Å, 1401.16 Å). The recording of each line is assigned with at least 70 spectral-pixels.

Request to EIS:
Slit: 512”x1”
Scan: 250”; 1” steps
Exposure time: 50 sec
Duration: 210 min
Line list: kpd_01_qs_60, which contains some strong emission lines from chromosphere, upper transition regiono, corona, e.g. He II (5.0x10^4 K, 256.32 Å), Mg VI (4.0x10^5 K, 270.42 Å), Si VII (6.3x10^5 K, 275.35 Å), Si X (1.3x10^6 K, 258.49 Å), and Fe XV (2.0x10^6 K, 284.16 Å).

Request to SOT:
High resolution Dopplergram, magnetogram and intensity
Spatial resolution: 0.08”/pixel
FOV: 328”x164”
Cadence: 0.5 minute

Request to XRT:
Routine observation in the time range selected for the purpose of identifying a proper quiet-Sun region on the solar disk;