Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

PEM32-05 Room:503 Time:May 2 10:10-10:30

Observations of Alfvenic waves in the solar atmosphere

OKAMOTO, Joten[1*]

[1]ISAS/JAXA

Coronal heating and the acceleration of the solar wind are unsolved problems in solar physics. The propagation of Alfven waves along magnetic field lines is one of the candidate mechanisms to carry energy to large distances from the surface and heat the coronal plasma. However, such waves had not been observed for years.

The solar physics satellite, Hinode, was launched in 2006, and it opened the door to the world of coronal waves. Hinode observations have directly resolved small-scale transverse oscillations of field lines as a result of Alfven/Alfvenic waves in prominences (Okamoto et al. 2007) and spicules (De Pontieu et al. 2007) which are typical chromospheric features embedded in the corona. These waves had a period of 2-5 minutes (low frequency) and the velocity amplitudes are up to 20 km/s. If we assume these are propagating waves, the waves have enough power to heat the corona. However, since the wavelength of these waves is as long as or longer than the observed structures, it is difficult to resolve the phase difference along the field lines. This means we cannot know whether they are propagating or standing waves.

More recently, we had a challenge to detect ”propagating” waves (Okamoto and De Pontieu 2011). In this study, we developed an algorithm to detect spicules and phase difference of waves along them automatically. As a result, upward- and downward-propagating waves as well as standing waves were successfully detected. With statistical analyses, it is found that the behaviour of waves depends on the evolution of spicules, and numerous waves are reflected at the top of spicules. These waves detected in this study are high-frequency ones, and the energy is not larger than that of low-frequency ones. Hence, it is suggested that low-frequency waves are more important for coronal heating.

Finally, oscillations/waves shown here are ubiquitous in the solar atmosphere and ”wave hunting” is getting more active after the Hinode launch. In addition, investigation of coronal waves is important for the derivation of physical parameters such as coronal magnetic field strength, which it is difficult to measure in observations. In this talk, I will show these studies with Hinode and introduce a new result with a new satellite ”IRIS”.

Keywords: Sun, corona, wave, Hinode