Heating and mass ejection in the solar chromosphere

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At Hida observatory of Kyoto University, we continue to study the heating and mass ejection phenomena in the solar chromosphere with Domeless Solar Telescope (DST) and Solar Magnetic Activity Research Telescope (SMART). Our scientific objectives are to reveal the mechanism of heating and mass acceleration of 10000K plasma, which will be the energy and mass source of solar coronal dynamics. Observations are done by spectroscopy and monochromatic imaging of the solar active events and ubiquitous small scale ejections, in cooperation with other space observatories such as Hinode, SOHO and etc.

In this work, we will report some recent observational results on the following topics:

(1) Plage heating and waves : Analysis of a long time series of CaII K spectrograms at a plage area showed us a clear coexistence of 3- and 5-min oscillation in Doppler velocity. Line profile synthesis by MULTI code of an acoustic wave propagating atmosphere revealed us a unsteady heating of plage chromosphere.

(2) Disk spicules : After applying a special image processing (MADMAX) to SOT/Hinode BFI in CaII H, we clearly identified numerous ejecting features in a plage area. Their morphological shapes of thin tapered cylinder and their dynamics strongly suggest us that they are spicules in a plage. Comparison with limb spicules will be discussed.

(3) Supergranular network and coronal heating : XRT/Hinode showed us a vast variety of coronal heating in the solar corona. Close inspection of XRT movie and H-alpha wing movie tell us that brightenings in XRT distribute along the SG network pattern, not in the cell center. Almost all of the XRT brightenings are associated with H-alpha bright area or with enhanced network area of strong magnetic field strength. This suggest us that solar magnetic field has a strong influence of the atmospheric heating even in quiet area of the sun.

(4) Moreton waves and the filament ejection : We, at Hida observatory, have already detected about 30 Moreton wave events, which generally are blasted off from strong solar flare sites and propagate over a restricted sector on the solar surface. And active region filaments are ejected nearly along the same path as the waves. Why do Moreton waves propagate in a restricted sector of propagation? Why do filament eruption follow the wave paths? We will discuss these unknowns with the help of potential magnetic field topology of the global corona referencing the fast-mode-shock model of Moreton wave by Uchida.