Chromospheric active phenomena, reconnections, coronal heating process, prominence activities and sunspot evolution that are all related with the solar magnetic field have become more clear by recent MHD simulations and high-resolution observations with the HINODE satellite. In order to quantitatively verify the present model of such phenomena, we have continued simultaneous and high-cadence observations of diversified observation from the photosphere to the corona with the HINODE satellite and spectrum observation at the Hida Obs. In this poster, we introduce some typical results of cooperative observations between Hida Observatory & Hinode Satellite for above-mentioned themes (HOP 0012, 0075, 0128) during these several years.

Abstract:

   1. Emerging Flux Regions (EFR)
      a. Rise velocity of emerging loops
      b. Sunspots
         2a. Penumbral jets
         2b. Heating process on sunspots (wave propagation and coronal responses)
      c. Evolution of magnetic element at the footpoint of EFR
         2c. Ellerman Bombs
         3. Ellerman Bombs
            Observation of reconnection jets and X-ray signatures in the corona.

   1. Flare kernels
   2. Sunspots
      a. Penumbral jets
      b. Heating process on sunspots (wave propagation and coronal responses)
      2c. Ellerman Bombs under AFS
      2d. Chromospheric jets around sunspots
   3. Emerging flux regions
      a. Rise velocity of emerging loops and coronal response
      b. Evolution of magnetic element at the footpoint of EFR
      c. Ellerman bombs under AFS
      d. Chromospheric jets around EFR
      e. Shock waves just below the arch filaments in EFR
   4. Oscillations of prominences & dark-filaments
   5. Chromospheric jets
      a. plage jets (high cadence spectrum measurement)
      b. Jets in the quiet region
      5. Chromospheric jets
   6. Limb spicules
      a. Difference between polar region and equatorial region
      b. Difference between coronal hole region and other regions
   7. Relation between XBPs and supergranulation boundary
   8. Polar X-ray jets

5. Emerging Flux
   Otsuji et al. (2010), PASJ, 62, 883
   Case study of emerging magnetic fluxes.

6. Chromospheric Jets
   Motomura et al. (2010), PASJ, 62, 891
   Chromospheric jets observed with HINODE/EPIC.
   Time evolution of line profile of the jet.

We confirmed that the "magnetic energy release rate" by magnetic cancellation around the jet is comparable to the total energy loss of the jet estimated from the radiative loss in the Ca II K line.

4.2 Fine Structure of Ellerman Bombs
   Hashimoto et al. (2010), PASJ, 62, 879
   We found that Ellerman bombs are composed of a few fine subcomponets whose characteristics are as follows:
   - The mean duration, the mean width, the mean length, and the mean aspect ratio of the subcomponents were 380 s, 170 km, 450 km, and 2.7, respectively.
   - Subcomponents started to appear on the magnetic neutral line, and extended their lengths from the original locations.
   - When the Ca II H line of EBs showed the characteristic appearance or re-brightening of subcomponents.
   - They correspond to successive and intermittent magnetic reconnections.

4.3 Model Atmosphere of Jets
   Umeh et al., Submitted to PASJ in 2010
   Observationally estimated velocity distribution along the jet.

We observably confirmed the magnetic reconnection point and bidirectional flow in the chromosphere.

7. Wave Propagation in the chromosphere
   Ongoing analysis:
   a. Wave propagation in prominences => Isobe et al., Sawada et al.
   b. Wave propagation in sunspots => Oba et al.

8. Educational Effects of these cooperative observations
   Achieved effects:
   a. Wave propagation in prominences => Isobe et al., Sawada et al.
   b. Wave propagation in sunspots => Oba et al.

Ongoing effects:
   a. Wave propagation in prominences => Isobe et al., Sawada et al.
   b. Wave propagation in sunspots => Oba et al.

Theme: Three dimensional structure and evidences of magnetic reconnection at chromospheric jets (Ellerman bombs)

M. Mori => Graduation thesis
   Theme: Three dimensional structure and evidences of magnetic reconnection at solar flares