Acceleration mechaism of coronal jets

*Masumi Shimojo[1]

1.National Astronomical Observatory of Japan

A coronal jet is a jet phenomenon in solar corona, and a flow of hot plasma (>1 MK) through a magnetic flux tube. The phenomenon has been investigated from YOHKOH era (1990's), and there is no doubt that a coronal jet is produced by the energy released by magnetic reconnection based on numerous observing and theoretical studies. One of the remained puzzles of coronal jets is the acceleration mechanism of hot plasma. Shibata et al. (1992), which reported the discovery of coronal jets, already predicted that the hot plasma flow in a corona jet is a reconnection outflow (magnetic driven flow) or/and a flow by chromospheric evaporation (gas-pressure driven flow). The high spatial and cadence X-ray images obtained with the X-Ray Telescope aboard Hinode satellite revealed that both flows exist in a coronal jet (Cirtain et al. 2007). Nevertheless, it is not clear which flow dominates a coronal jet. In this paper, I review recent results related with the puzzle, and discuss what is a key physics for the acceleration mechanism in a coronal jet.

Keywords: Sun, Corona, Jet

Radiation Magnetohydrodynamic Simulations of Solar Chromospheric Jets

*Haruhisa Iijima[1,2], Takaaki Yokoyama[2]

1.Institute for Space-Earth Environmental Research, Nagoya University, 2.School of Science, The University of Tokyo

In the solar chromosphere, which is a thin layer between the visible surface and the hot corona, we commonly observe various jet phenomena such as spicules. Because of a larger density of the plasma, the energy loss in the chromosphere is much stronger than the corona. Quantitative understanding of chromospheric jets is important not only for understanding of the chromospheric phenomena themselves but also for the energy transport into the corona and the solar wind.
In this presentation, we will show our recent results of the numerical simulations by our radiation magnetohydrodynamic code for the comprehensive modeling of the solar atmosphere. The code contains the gravity, the radiative cooling, the thermal conduction, and the thermodynamic effect of partial ionization. The numerical domain includes the convective unstable layer that drives the motion in the simulated chromosphere. Many chromospheric jets with the maximum height greater than 6 Mm are reproduced in the simulations. The typical formation process and the statistical behavior of simulated jets are investigated. We will discuss the comparison between the two-dimensional and three-dimensional simulations and the relation to the observational signatures.

Keywords: Plasma Jets, Solar Chromosphere, Magnetohydrodynamics

Origin of large-scale plasma jets in the magnetosheath

*ALEXEI DMITRIEV[1]

1.Institute of Space Science, National Central University, Jungli City, Taiwan

Previous studies shown that an important source of the solar wind plasma inside the dayside magnetosphere is large-scale plasma jets, fast and dense plasma streams in the magnetosheath. A number of mechanisms have been proposed for the jet generation and are used for interpretation of experimental data. THEMIS observations of plasma and magnetic field in the magnetosheath provided a lot of new information about plasma jets. Statistically, it has been shown that the duration of jets peaks at ~30 second and they are predominantly observed during intervals of quasi-radial IMF. It is believed that most of jets are formed at rippled quasi-parallel bow shock. However, this mechanism is difficult to apply for generation of large-scale jets of minute duration. We studied large-scale plasma jets, whose duration varies from 30 sec to 3 minutes. From THEMIS observations, it was collected 642 large-scale jets in the years 2007 –2009. Analysis of those jets with using upstream solar wind conditions has shown that the jets generated under quasi-radial IMF are usually slower and weaker. Fastest and strongest jets are generated in interaction of the bow shock with rotational discontinuities.

Keywords: solar wind, bow shock, magnetosheath, plasma jets

