# Small-scale Jetlike Activities in Sunspots and their Driving Mechanism

# Yukio Katsukawa[1]; Jan Jurcak[1]

[1] NAOJ

HINODE Solar Optical Telescope (SOT) discovered small scale explosive activities taking place ubiquitously in the solar chromosphere. One of the activities are frequent occurrence of jetlike brightenings found in the chromosphere above sunspot penumbrae, and are referred to as penumbral microjets. They have the width of about 300km, the length of about 3000km, and the lifetime of 30sec or shorter. These small spatial and temporal scales have made it difficult to detect them with ground-based telescopes. Sunspot penumbrae have filamental magnetic structures generated by strong interaction between convection and strong magnetic fields. There are two magnetic components in penumbrae: One is a horizontal flux tubes, and the other is more vertical background fields. The two components coexist there, and form so-called uncombed magnetic configuration on a scale of about 1000km. Current sheets are naturally generated at the boundary of the two magnetic components, and magnetic energies can be released through magnetic reconnection causing jetlike brightenings in the chromosphere. It was also found that sporadic occurrence of downflows in penumbral photospheres associated with brightenings seen in chromospheres, which also supports the magnetic reconnection.

The penumbral microjets are important in terms of the following aspects. (1) Magnetic reconnection may be responsible for transient energy release even in the condition of weakly ionized and collisional plasma in the photosphere and chromosphere. (2) Magnetic reconnection can take place even in the condition when magnetic fields are not anti-parallel at the tangential discontinuity. (3) The penumbral microjets may be related to consumption of magnetic energies and restructuring of filamental magnetic configuration in a sunspot.