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Penumbral Dynamics and its Manifestation in the Overlying Chromosphere MARGARITA RYUTOVA, LLNL/IGPP, THOMAS BERGER, THEODOR TARBELL, ZOE FRANK, ALAN TITLE, LMSAL — Mature sunspots are usually surrounded by penumbra - a dense conglomerate of a random interlaced flux tubes with varying inclinations. High resolution observations show a fine substructure of penumbral filaments and new regularities in their dynamics. These regularities fit well our recent model of penumbra based on cascading reconnection events occurring in the system of non-collinear flux tubes. Each act of reconnection generates twist in the reconnected filaments and facilitates the onset of a screw pinch instability, consistent with the observations showing that individual filaments are cylindrical helices with a pitch/radius ratio providing their stability. In addition, the post-reconnection products produce a sling-shot effect that generates oblique shocks and leads to appearence of a lateral jets. Here we report high resolution (120-180 km) high cadence (15-30 sec) observations taken with the Solar Optical Telescope (SOT) on the Hinode satellite. Co-aligned multi-hour movies taken simultaneously in several wavelengths show detailed behavior of penumbra filaments and their effect on the overlying chromosphere. We confirm the ubiquitous nature of penumbral micro-jets recently discovered by SOT instrument (Katsukawa et al. 2007, AAS 210, 94.13), and present quantitative analysis of chromospheric jets based on our recent model of penumbra.

Margarita Ryutova
LLNL/IGPP

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