

*Hinode-3: 3rd Hinode Science Meeting  
Hitotsubashi Memorial Hall, Tokyo  
1-4 December, 2009*

## **Sea-serpent penumbral filaments: a constrain for modeling and understanding the penumbra.**

Alberto Sainz Dalda

*Stanford-Lockheed Institute for Space Research*

Luis Bellot Rubio

*Instituto de Astrofísica de Andalucía*

**Abstract.** We present a study of bipolar, sea-serpent-like structures in the penumbra of sunspots. Our analysis is based on high-resolution observations of AR 10923 taken with the Hinode/NFI and SP on November 14, 2006. The circular polarization maps reveal the presence of many elongated structures in the middle penumbra and beyond. They consist of two opposite-polarity patches that move together as a single entity toward the outer penumbral boundary, where they become moving magnetic features. Their Stokes profiles suggest a complex magnetic topology. The existence of opposite polarities in the penumbra is well known from previous analyses, but this is the first time that their bipolar nature is unveiled. Our observations also demonstrate that they are intimately connected to the dynamical evolution of the penumbra. These bipolar structures provide new constraints to theoretical and numerical models of sunspots.