IAU XXVIII General Assembly summary for the Dr. Thomas R. Metcalf Travel Award

Juan Martínez-Sykora
August 20-31, 2012, Beijing, China

For this general assembly, Juan Martínez-Sykora presented an invited talk for the Symposium 294 "Solar and astrophysical dynamos and magnetic activity" August 22.

Juan Martínez-Sykora is a postdoc student at the University of Oslo and visitor of Stanford University-Lockheed Martin Solar & Astrophysics Lab. (2009-). He did his master Thesis in Tenerife at the IAC supervised by Fernando Moreno-Insertis (2004-2006). He did the PhD at the University of Oslo supervised by Viggo H. Hansteen and Mats Carlsson (2006-2009). His research focuses and interest in radiative-MHD modeling of the solar atmosphere, and comparisons to observations, including the effects of flux emergence on the solar atmosphere, as well as effects of neutrals on chromospheric physics.

Invited talk: Current status of self-consistent 3D radiative-MHD simulations

In recent years, there has been major progress in the development of self-consistent models of the solar atmosphere. Many of the radiative-MHD simulations aim to capture the physics from the convection zone and photosphere. Some address the lower atmosphere, i.e, from the convection zone to the corona. Our research group has been putting great effort in including self-consistently the various physical process in the chromosphere.

The chromosphere is filled with several types of spicules that occur frequently all over the Sun. At least two types with different behavior have been identified. In order to understand the underlying process, we used simulations from the Bifrost code, which solves the radiative transfer with scattering, and includes thermal conduction along the magnetic field lines. Modeling the chromosphere is a difficult task, because, it requires complex input physics and the chromosphere is strongly linked to and depends on the layers above and below, and the modeled atmosphere requires the inclusion of different layers (convection zone, photosphere the chromosphere itself and the transition region). In addition, synthetic observables are required for an ultimately comparison. These issues have been rised in the talk describing the different type of spicules using the simulations. I also remark that from the discrepancies we can also learn what is needed in the simulation in order to be able to simulate and understand the spicules properly.

Finally, other process are important in the chromosphere as hydrogen ionization is time dependent, and the plasma is partially ionized. We have implemented these effects in the Bifrost code. The partial ionization effects impact the thermal, magnetic and dynamics of the chromosphere, and indirectly the corona. The partial ionization effects (Hall term and ambipolar effect) are strongly dependent with the ionization fraction, therefore the time-dependent ionization of H has to be taken into account.