The solar chromosphere can be observed well through strong absorption lines. We infer the physical parameters of chromospheric plasmas from these lines using a multilayer spectral inversion. This is a new technique of spectral inversion. We assume that the atmosphere consists of a finite number of layers. In each layer the absorption profile is constant and the source function is allowed to vary with optical depth. Specifically, we consider a three-layer model of radiative transfer where the lowest layer is identified with the photosphere and the two upper layers are identified with the chromosphere. This three-layer model is fully specified by 13 parameters. Four parameters can be fixed to prescribed values, and one parameter can be determined from the analysis of a satellite photospheric line. The remaining eight parameters are determined from a constrained least-squares fitting. We applied the multilayer spectral inversion to the spectral data of the Hα and the Ca II 854.21 nm lines taken in a quiet region by the Fast Imaging Solar Spectrograph (FISS) of the Goode Solar Telescope (GST). We find that our model successfully fits most of the observed profiles and produces regular maps of the model parameters. We conclude that our multilayer inversion is useful to infer chromospheric plasma parameters on the Sun.

[구 SS-05] Detection of Opposite Magnetic Polarity in a Light Bridge : Its Emergence and Cancellation in association with LB Fan-shaped Jets

Eun-Kyung Lim[1], Heesu Yang[1], Vasyl Yurchyshyn[2], Jongchul Chae[3], Donguk Song[4], Maria S. Madjarska1[5]
[1]KASI, [2]BBSO, [3]SNU, [4]NAOJ, [5]MPIS

Light bridges (LBs) are relatively bright structures that divide sunspot umbrae into two or more parts. Chromospheric LBs are known to be associated with various activities including fan-shaped jet-like ejections and brightenings. Although magnetic reconnection is frequently suggested to be responsible for such activities, not many studies presented firm evidence to support the scenario. We carry out magnetic field measurements and imaging spectroscopy of a LB where fan-shaped jet-like ejections occur with co-spatial brightenings at their footpoints. We study their fine photospheric structures and magnetic field changes using TiO images, Near-InfraRed Imaging Spectropolarimeter data, and Hα data taken by the 1.6 m Goode Solar Telescope. As a result, we detect magnetic flux emergence in the LB that is of opposite polarity to that of the sunspot. The new flux cancels with the pre-existing flux at a rate of 5.6×10^{18} Mx hr^{-1}. Both recurrent jet-like ejections and their footpoint brightenings are initiated at the vicinity of the magnetic cancellation, and show apparent horizontal extension along the LB at a projected speed of 4.3 km s^{-1} to form the fan-shaped appearance. Based on these observations, we suggest that the fan-shaped ejections may have resulted due to slipping reconnection between the new flux emerging in the LB and the ambient sunspot field.

[구 SS-06] Surface exposure age of (25143) Itokawa estimated from the number of mottles on the boulder

Sunho Jin, Masateru Ishiguro
Seoul National University

Various processes, such as space weathering and granular convection, are occurring on asteroids' surfaces. Estimation of the surface exposure timescale is essential for understanding these processes. The Hayabusa mission target asteroid, (25143) Itokawa (Sq-type) is the only asteroid whose age is estimated from remote sensing observations as well as sample analyses in laboratories. There is, however, an unignorable discrepancy between the timescale derived from these different techniques. The ages estimated based on the solar flare track density and the weathered rim thickness of regolith samples range between 102 and 104 years [1][2]. On the contrary, the ages estimated from the crater size distributions and the spectra cover from 106 to 107 years [3][4].

It is important to notice that there is a common drawback of both age estimation methods. Since the evidence of regolith migration is found on the surface of Itokawa [5], the surficial particles would be rejuvenated by granular convection. At the same time, it is expected that the erasure of craters by regolith migration would affect the crater size distribution.

We propose a new technique to estimate surface exposure age, focusing on the bright mottles on the large boulders. Our technique is less prone to the granular convection. These mottles are expected to be formed by impacts of mm to cm-sized interplanetary particles. Together with the well-known flux model of interplanetary dust particles (e.g., Grün, 1985 [6]), we have investigated the timescale to form such mottles before they become dark materials again by the space weathering. In this work, we used three AMICA (Asteroid Multi-band Imaging Camera) v-band