

The Global COE Program

“The Next Generation of Physics, Spun from Universality and Emergence”

Bilateral International Exchange Program (BIEP, invite) report

Send report to: Your responsible Professor in Kyoto University

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(Year/Month/Day)___ 2011 / 03 / 10 ___

Invited Student

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Research Project

Title	An imaging spectroscopic study of the EUV brightenings in active regions by Hinode/EIS
Duration	2011 Jan 5 – 2011 Feb 28

Please summarize your activities and results during your stay in Kyoto University. Also please describe how your stay has been beneficial to the graduate students in the institute. You can add a sheet, if you need more space. You can also write any comments and requests to the GCOE program.

In Kyoto University, we studied about 3 topics with researchers in Kyoto University.

First, we learned the analysis of the SOT data as well as the co-alignment of the SOT observations and the EIS scan images to know the magnetic configuration of the EUV brightenings. According to my research plan for the GCOE program, we focused on the investigation of the EUV brightenings using the spectroscopic analysis. In order to know the characteristics of the brightenings we have to check photospheric magnetograms. However the MDI magnetograms previously used has low temporal resolution during the observing period of these brightenings, so we cannot ensure the canceling magnetic features (CMFs) from them. During my visit, we used the SOT data which has higher spatial and temporal resolutions. From learning the SOT data analysis, we found the CMF near the brightening which shows a distinct characteristics in the Doppler velocity compared to the other brightenings.

Second, we discussed a coronal jet observed by Hinode, AIA, and STEREO. The coronal jet shows the erupting jet feature in cool and hot temperatures. Using the high temporal and multi wavelength AIA images and Hinode XRT images, we found that the hot jet preceded its associated cool jet and their structures are well consistent with the numerical simulation of the emerging flux-reconnection model suggested by Yokoyama & Shibata (1995) and Nishizuka et al. (2008). The STEREO observation, which enables us to observe this jet on the disk, also shows that there was a dim loop associated with the jet. We found that the structure of its associated active region seen in STEREO is similar to that in AIA observed 5 days before. Based on this fact, we compared the jet morphology on the limb with the magnetic fields extrapolated from a HMI vector magnetogram of this active region observed on the disk. Interestingly, the comparison shows that the open and closed magnetic field configuration correspond to the jet and the dim loop, respectively, as the Shibata's jet model predicted. From the comparison of this jet observation and the Prof. Shibata's simulation model, we found the similarities. Then after this GCOE program, we can collaborate on this jet study together.

From the GCOE program, third, we make a plan to collaborate on investigating the EUV brightenings related to the optical wavelength (Ca II and H alpha) brightenings. For this research, we are going to use a joint observation of the Hinode EIS and Hida DST (Domeless Solar Telescope). These two instruments provide us with the multiple wavelength spectroscopic data from optical to EUV wavelength, which corresponds to the chromosphere and corona, respectively. For this study, I visited Hida observatory during the period of the GCOE program. Then we selected the joint observation program (HOP 128) in August 2010. We plan to use this joint observation of EIS and DST telescope for the study of the active region brightenings observed in multi-wavelengths.

The GCOE programs gave us not only a chance to know the researchers who are in the same field but also an opportunity to collaborate with these researchers.