

グローバル COE プログラム  
「普遍性と創発性から紡ぐ次世代物理学－フロンティア開拓のための自立的人材養成－」  
双方向国際交流プログラム(BIEP, 派遣) 報告書

2011 年 4 月 6 日

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共同研究

研究課題名	和文	
	英文	Investigating the external geometry and internal structure of quiescent solar prominences
派遣期間		

実際に行った研究活動、成果など簡潔に記述してください。スペース不足の場合は、用紙を追加してください。また、GCOE への今後の要望があれば記してください。

During January and February of this year I visited the Harvard-Smithsonian Center for Astrophysics to work with Dr. Aad van Ballegooijen. During this time we planned to research the formation of tangled magnetic field inside quiescent prominences (cool dense structures found in the solar corona), but on discussion there was a lot of preparatory work that was necessary. The project that we decided to work on, as a prelude to investigating the tangled field, is the formation of the equilibrium and internal structure of quiescent prominences.

To do this we used 2.5D models of flux ropes (believed to be the global structure associated with prominences) in a nonlinear force-free state developed by Dr. van Ballegooijen. We use three such models, where various parameters (such as the relative magnetic pressure compared to the gas pressure i.e. plasma beta) can be varied. To these models we slowly added mass. This allows the change in the global magnetic structure and the local prominence structure to be investigated.

Due to the two orders of magnitude in length scales between prominences and the surrounding corona as well as the angle of magnetic field at the boundary, it is difficult to simulate this in full. To allow the simulation to proceed we use a prominence temperature

that is a factor of 4 times larger than that of the prominence as well as smoothing the magnetic field to be vertical at the boundary (adding explicit forces to balance the created Lorentz force). The preliminary results from this simulation show that the addition of mass results in a significant proportion of the energy of the system is stored in the prominence and assesses the global change in structure of the magnetic field.

Working in the Solar/Stellar X-ray group at CFA gave me the opportunity to hear about their work. This was especially interesting as Ed De Luca (PI of XRT on Hinode) is part of the department, which meant that I could learn a lot about what the researchers in America are doing with Hinode data. Also there are a lot of people that work with AIA data from the SDO satellite. This meant I had the chance to familiarize myself with the type of data that is available. I also got the chance to give a seminar at CFA on my research on the magnetic Rayleigh-Taylor instability in quiescent prominences. These discussions help me finish the writing of a Letter I am trying to publish on the subject.

#### Suggestions about the BIEP programme

1. On BIEP, it may be quite common for students to be offered money from the host institute. I was in this situation, and as I was receiving money from BIEP I was told I must turn them down. However, if we were encouraged to take this money, returning the money we received for daily expenditures from BIEP. This money could be recycled in the system and made available for other students to study abroad. This would allow more students to go on BIEP, greatly increasing its effectiveness as a study abroad programme.