GCOE　国際会議出席報告書（外国旅費用）

拠点リーダー　川合　光　殿

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発表題名	- Predicting observational signatures of coronal heating by Alfvén waves and nanoflares - Heating and cooling of magnetic flux tubes		
著者名	Antolin Patrick		
会議名称 ・開催期間	Second Hinode Science Meeting “Beyond Discovery – Toward Understanding” 自２００８年０９月２９日　～　至２００８年１０月０３日 Kyoto University – Los Andes University academic collaboration 自２００８年１０月０４日　～　至２００８年１０月１８日		
開催地（国、市）	USA・Boulder, Colorado – National Center for Atmospheric Research Bogotá, Colombia – Los Andes University		
出張期間	自２００８年０９月２９日　～　至２００８年１０月２０日		
国別参加者数	– ２００人 – ２５人		

発表内容、聴衆の反応、質疑応答、その他について簡潔に記述してください。
(口頭発表・ポスター発表の別も文中に明記すること。)

The presentation made in the Second Hinode Science Meeting concerned the coronal heating problem, one of the most important unsolved problems in astrophysics. Two of the most popular coronal heating mechanisms are considered – Alfvén wave heating and nanoflare-reconnection heating – and applied to a magnetic flux tube as the ones observed in the real solar corona. Results from simulations are converted into observables, such as flow patterns, Doppler velocities, X-ray intensity profiles, and statistics of heating events. Every observable is found to be different depending on the coronal heating mechanism that is applied, allowing thus ways of distinguishing between heating mechanisms when they operate in the corona.

The presented research was received with general approval and gave rise to interesting discussion sessions. Positive comments were also received about the oral presentation itself (oral and presentation clarity).

In the Q&A session after the talk, Dr. Klimchuk asked about the efficiency of the wave damping from thermal conduction and viscosity. In the present model, due to the strength of the shocks and their ubiquitous character, dissipation is large. Emphasis was also put on resonant absorption as a heating mechanism. This mechanism cannot be studied however in the present model, a higher dimensional model is needed for that purpose. Dr. Velli pointed out that the described heating mechanism in the Alfvén wave heating model was not mode conversion and subsequent shock heating but rather parametric decay. The later occurs however when dealing with circularly polarized Alfvén waves, and not linearly polarized waves, which are the ones considered in the present model.

A comparison of the considered heating mechanisms with resonant absorption needs to be performed. Results by Dr. Klimchuk tend to point out that heating from resonant absorption is uniform in a loop. This can have important observational consequences. This point needs to be addressed in the near future.

In Los Andes University (Bogotá, Colombia), two different presentations were made in two different seminars during the first week. The first presentation was made in the physics colloquium and was essentially the same as the presentation made in the Second Hinode Science Meeting but adapted for a more general public consisting of students of many fields of physics. The talk was 50 minutes long with 10 minutes for questions. The second talk was given in the Astronomy seminar and was 50 minutes long with 10 minutes for questions. I changed the topic and talked about coronal rain, which are cool condensations observed in H alpha flowing down

coronal loops. The presented work proposes coronal rain as an indicator of the operating coronal heating mechanism in loops. The two most popular heating mechanisms are considered, the Alfvén wave heating model and the nanoflare heating model. It is shown that Alfvén wave heated loops are unable to exhibit catastrophic cooling which is thought to be the cause of coronal rain. This phenomenon is basically the loss of thermal equilibrium, radiative losses overwhelming the heating mechanism and positive thermal conduction flux. On the other hand, nanoflare heated coronas where the heating is concentrated at the footpoints are able to produce catastrophic cooling. Also, when a photospheric driver creating Alfvén waves is considered in nanoflare heated loops catastrophic cooling is suppressed for amplitudes of the driver that match observations. Only low amplitudes of the photospheric velocity fields (hence low energy flux from Alfvén waves) allow catastrophic cooling to happen. This result favors nanoflare heating over Alfvén wave heating for a coronal heating mechanism.
The people got very interested in both talks and asked many general questions. For instance, questions about how to measure the solar magnetic field were asked, and also about the present state of solar telescopes, achieved resolution and other features. People was very impressed with the images taken by the Japanese Hinode satellite.

The second week in Bogotá was devoted to discussion about a possible academic collaboration between the physics and astronomy departments at Kyoto University and the physics department at Los Andes University. For this purpose Dr. Yoshiteru Maeno of the superconductivity group at Kyoto University was invited to Los Andes University. During the week many meetings were arranged with many physics groups at Los Andes University for Dr. Maeno. Meetings with the superconductivity and magnetism group, biophysics group, high-energy physics group, and astronomy group were arranged. Also, a meeting with some Professors at National University of Bogotá was realized. Many topics were discussed, such as the GCOE program, scientific collaboration in each field, and possible donations of equipment from Kyoto University. A meeting with the chancellor and vice-chancellor of Los Andes University was also conducted.
A complete report about this meeting is being written and will be handled to each institution.