boundary, (4) minimize the difference between the estimated projection points with the observed ones. We apply this model to several halo CMEs and compare the results with those from other methods such as a Graduated Cylindrical Shell model and a geometrical triangulation method.

[구 SS-17] RADIAL AND AZIMUTHAL OSCILLATIONS OF HALO CORONAL MASS EJECTIONS

Harim Lee[1], Y.-J. Moon[1], V. M. Nakariakov[1,2]
[1]School of Space Research, Kyung Hee University, Yongin, Korea,
[2]Centre for Fusion, Space & Astrophysics, Physics Department, Univ. of Warwick, UK

We present the first observational detection of radial and azimuthal oscillations in full halo coronal mass ejections (HCMEs). We analyze nine HCMEs well-observed by LASCO from Feb 2011 to Jun 2011. Using the LASCO C3 running difference images, we estimated the instantaneous apparent speeds of the HCMEs in different radial directions from the solar disk center. We find that the development of all these HCMEs is accompanied with quasi-periodic variations of the instantaneous radial velocity with the periods ranging from 24 to 48 mins. The amplitudes of the instant speed variations reach about a half of the projected speeds. The amplitudes are found to anti-correlate with the periods and correlate with the HCME speed, indicating the nonlinear nature of the process. The oscillations have a clear azimuthal structure in the heliocentric polar coordinate system. The oscillations in seven events are found to be associated with distinct azimuthal wave modes with the azimuthal wave number m=1 for six events and m=2 for one event. The polarization of the oscillations in these seven HCMEs is broadly consistent with those of their position angles with the mean difference of 42.5°. The oscillations may be connected with natural oscillations of the plasmoids around a dynamical equilibrium, or self-oscillatory processes, e.g. the periodic shedding of Alfvenic vortices. Our results indicate the need for advanced theory of oscillatory processes in CMEs.

[구 SS-18] Algorithm for Detection of Solar Filaments in EUV

Anand D Joshi, Kyung-Suk Cho
Korea Astronomy and Space Science Institute

In today's age when telecommunications using satellite has become part of our daily lives, one has to be employ preventive measures to avert any possible danger, of which solar activity is the major cause. Coronal mass ejections (CMEs) heading towards the Earth can lead to disturbances in the Earth's magnetosphere, if their magnetic field is oriented southward. Monitoring of solar filaments in this case becomes very very crucial, as their eruption is associated with most of the CMEs. Monitoring of solar filaments in this case becomes very very crucial, as their eruption is associated with most of the CMEs. Also, filaments show activation up to a few hours prior to launch of a CME and thus can provide advance warning. In this study, we present an algorithm for the detection of solar filaments seen in the extreme ultraviolet (EUV) from Atmospheric Imaging Assembly (AIA) on board the Solar Dynamics Observatory (SDO). Various morphological operations are employed to identify and extract the filaments. These filaments are then tracked in order to determine their size and location continuously.

[구 SS-19] Where is the coronal loop plasma located, within a flux rope or between flux ropes?

Daye Lim (임다예), G. S. Choe (최광선), and Sibaek Yi (이시백)
School of Space Research, Kyung Hee University, Yongin 446-701, Korea

Without scrutinizing reflection, the plasma comprising a coronal loop is usually regarded to reside within a flux rope. This picture seems to have been adopted from laboratory plasma pinches, in which a plasma of high density and pressure is confined in the vicinity of the flux rope axis by magnetic tension and magnetic pressure of the concave inward magnetic field. Such a configuration, in which the plasma pressure gradient and the field line curvature vector are almost parallel, however, is known to be vulnerable to ballooning instabilities (to which belong interchange instabilities as a subset). In coronal loops, however, ideal MHD (magnetohydrodynamic) ballooning instabilities are impeded by a very small field line curvature and the line-tying condition. We, therefore, focus on non-ideal (resistive) effects in this study. The footpoints of coronal loops are constantly under random motions of convective scales, which twist individual loop strands quite randomly. The loop strands with the axial current of the same direction tend to coalesce by magnetic

reconnection. In this reconnection process, the plasma in the loop system is redistributed in such a way that a smaller potential energy of the system is attained. We have performed numerical MHD simulations to investigate the plasma redistribution in coalescence of many small flux ropes. Our results clearly show that the redistributed plasma is more accumulated between flux ropes rather than near the magnetic axes of flux ropes. The Joule heating, however, creates a different temperature distribution than the density distribution. Our study may give a hint of which part of magnetic field we are looking to in an observation.

[구 SS-20] A New Method of Coronal Magnetic Field Reconstruction

Sibaek Yi (이시백), G. S. Choe (최광선), and Daye Lim (임다예)
School of Space Research, Kyung Hee University, Yongin 446-701, Korea

In the past two decades, diverse methods and computer codes for reconstruction of coronal magnetic fields have been developed. Some of them can reproduce a known analytic solution quite well when the magnetic field vector is fully specified by the known solution at the domain boundaries. In practical problems, however, we do not know the boundary conditions in the computational domain except the photospheric boundary, where vector magnetogram data are provided. We have developed a new, simple variational method employing vector potentials. We have tested the computational code based on this method for problems with known solutions and those with actual photospheric data. When solutions are fully given at all boundaries, the accuracy of our method is almost comparable to best performing methods in the market. When magnetic field vectors are only given at the photospheric boundary, our method excels other methods in "figures of merit" devised by Schrijver et al. (2006). Our method is expected to contribute to the real time monitoring of the sun required for future space weather prediction.

별 생 성

[구 SF-01] ALMA Observations of a Keplerian Disk in the Infalling Envelope of L1527

Jeong-Eun Lee[1], Seokho Lee[1], Neal Evans[2], James Di Francesco[3], Minho Choi[4], Jes Jorgensen[5], Philip Myers[6], Diego Mardones[7]
[1]*Kyung Hee University, Korea,*
[2]*University of Texas at Austin, USA,*
[3]*National Research Council Canada, Herzberg Institute of Astrophysics, Canada,*
[4]*Korea Astronomy and Space Science Institute, Korea,*
[5]*University of Copenhagen, Denmark,*
[6]*Harvard Smithsonian CfA, USA,*
[7]*Universidad de Chile, Chile*

We report Atacama Large Millimeter/submillimeter Array (ALMA) cycle I observations of L1527, a class 0 object with an infalling envelope and a rotating disk. HCO+ and HCN J=4-3 show strong redshifted absorption against the bright continuum emission associated with the optically thick disk or inner envelope. This redshifted absorption dip is an unambiguous evidence of infall. In addition, these lines and CS J=7-6 present the Keplerian rotation profile at their position-velocity diagrams, suggesting the formation of a Keplerian disk very early in star formation. We will present a model combining an infalling envelope and a Keplerian disk to fit the ALMA observations.

[구 SF-02] IGRINS observations toward Class I disk sources, IRAS03445+3242 and IRAS0429+2436

Seokho Lee[1], Jeong-Eun Lee[1], Sunkyung Park[1], and Daniel T. Jaffe[2]
[1]*Kyung Hee Univ.,*
[2]*The Univ. of Texas at Austin*

We present the high-resolution Immersion GRating INfrared Spectrograph (IGRINS) spectra of two Class I sources, IRAS03445+3242 and IRAS04239+2436. Both sources show the evidence of Keplerian disks; the broadened CO overtone ($\Delta v=2$) transitions in emission and neutral metal lines (Mg I, Fe I, and Al I) in absorption. The thin Keplerian disk with a rotational velocity of ~100 km s-1 and a gas temperature of 5000 K at the innermost annulus can reproduce the CO overtone transitions including the bandhead emission. The outer dusty disk or the envelope needs to fit the narrow absorption features overlaid on the broad emission lines in the CO overtone transitions.

[구 SF-03] Infrared and Radio observations of a small group of protostellar objects in the molecular core, L1251-C