리는 이러한 해석이 사실인지 관측을 이용해 검증하고, 타당한 물리적 해석을 찾는다. 이를 위해 STEREO 우주선이 SOHO에서 관측한 태양의 측면을 관측했던 2010년부터 2012년 관측자료를 사용하고, SOHO에서 관측한 햇무리 모양의 코로나질량방출 현상의 측면 모습이 예전의 해석대로 고깔모양을 보여주는지 STEREO 우주선의 관측자료와 비교한다. 우리는 햇무리 모양이 시선방향에 상관없는 이 현상 고유의 모양임을 확인 했으며 극자외선 관측결과와 수치계산 결과와 비교하여 이 햇무리 모양은 파동 현상의 결과임을 알았다. 이는 코로나질량방출 현상과 관련한 해석에 많은 변화가 필요함을 의미한다.

[구 SS-02] CME-CME Interaction near the Earth

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In coronagraph images, it is often observed that two successive CMEs merge into one another and form complex structures. This phenomenon, so called CME cannibalism caused by the differences in ejecting times and propagating velocities, can significantly degrade forecast capability of space weather, especially if it occur near the Earth. Regarding this, we attempt to analyze the cases that two CMEs are expecting to meet around 1 AU based on their arrival times. For this, we select 13 CME-CME pairs detected by ACE, Wind and/or STEREO-A/B. We find that 8 CME-CME pairs show a shock structure, which means they already met and became one structure. Meanwhile 5 pairs clearly show magnetic holes between two respective shock structures. Based on detailed investigation for each pair and statistical analysis for all events, we can get clues for following questions: 1) How does the solar wind structure change when they are merging? 2) Are there any systematic characteristics of merging process according to the CME properties? 3) Is the merging process associated with the occurrence of energetic storm particles? 4) What causes errors in calculating CME arrival times? Our results and discussions can be helpful to understand energetic phenomena not only close to the Sun but also near the Earth.

[구 SS-03] CME mean density and its change from the corona to the Earth

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Understanding three-dimensional structure and parameters (e.g., radial velocity, angular width, source location and density) of coronal mass ejections (CMEs) is essential for space weather forecast. In this study, we determine CME mean density in solar corona and near the Earth. We select 38 halo CMEs, which have the corresponding interplanetary CMEs (ICMEs), by SOHO/LASCO from 2000 to 2014. To estimate a CME volume, we assume that a CME structure is a full ice-cream cone which is a symmetrical circular cone combined with a hemisphere. We derive CME mean density as a function of radial height, which are approximately fitted to power-law functions. The average of power-law indexes is about 2.1 in the LASCO C3 field of view. We also obtain power-law functions for both CME mean density at 21 solar radii and ICME mean density at 1AU, with the average power-law index of 2.6. We estimate a ratio of CME density to background density based on the Leblanc et al.(1998) at 21 solar radii. Interestingly, the average of the ratios is 4.0, which is the same as a default value used in the WSA-ENLIL model.

[구 SS-04] Seeking magnetic separatrices on the solar surface using EUV waves

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The EUV wave is a disturbance that has been believed to be the fast-mode (shock) wave, which can propagate passing through magnetic field lines. After the passage of EUV waves, coronal streamers start to show kink-mode oscillations, and the footpoints, i.e., magnetic separatrices, of the oscillating streamers are observed as the so-called stationary front. We compare the stationary front observed by EUV imagers and coronal streamers observed in coronagraphic images. We analyze the successive events occurred in September 2011. We find that the stationary fronts are consistent with the coronal streamer boundaries, and they are located along the boundaries of coronal holes and active regions. Our results confirm that EUV waves are in fact fast-mode waves and demonstrate that the stationary front is a promising tool to probe into the source of slow solar wind that is the boundary of coronal streamers on the solar surface.

[구 SS-05] Discovery of highly dynamic and recurrent jets in a polar coronal hole observed by Hinode/SOT

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