Rs, respectively. Our results firstly demonstrate that LASCO-C2 blobs form the heights from about 1.7 to 2.0 Rs and they are generated by the tearing mode instability near the tips of current sheets.

[구 SS-06] The Excitation of Waves Associated with a Collapsing Granule in the Photosphere and Chromosphere

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We investigate a collapsing granule event and the associated excitation of waves in the photosphere and chromosphere. Our observations were carried out by using the Fast Imaging Solar Spectrograph and the TiO 7057Å Broadband Filter Imager of the 1.6 meter Goode Solar Telescope of Big Bear Solar Observatory. During our observations, we found a granule which became significantly darker than neighboring granules. The edge of the granule collapsed within several minutes. After the collapse, transient oscillations occurred in the photospheric and chromospheric layers. The dominant period of the oscillations is close to 4.5 minutes in the photosphere and 4 minutes in the chromosphere. Moreover, in the Ca II-0.5Å raster image, we observed brightenings which are considered as the manifestation of shock waves. Based on our results, we suggest that the impulsive collapse of a granule can generate upward-propagating acoustic waves in the solar quiet region that ultimately develop into shocks.

[초 SS-07] Toward Next Generation Solar Coronagraph: Diagnostic Coronagraph Experiment

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Korea Astronomy and Space Science Institute (KASI) has been developing a next-generation coronagraph (NGC) in cooperation with NASA to measure the coronal electron density, temperature, and speed using four different filters around 400 nm. To demonstrate technology for the measurement through the 2017 total solar eclipse across the USA, KASI organized an expedition team to demonstrate the coronagraph measurement scheme and the instrumental technology. The observation site was in Jackson Hole, Wyoming, USA. We built an eclipse observation system, so-called Diagnostic Coronal Experiment (DICE), which is composed of two identical telescopes to improve a signal to noise ratio. The observation was conducted with 4 wavelengths and 3 linear polarization directions according to the planned schedule in a limited total eclipse time of about 140 seconds.Polarization information of corona from the data was successfully obtained but we failed to get the coronal electron temperature and speed information due to a low signal-to-noise ratio of the optical system. In this study, we report the development of DICE and observation results. TSE observation and analysis by using our own developed instrument gave an important lesson that a coronagraph should be carefully designed to archive the scientific purpose. This experience through TSE observation will be very useful for a success of NASA-KASI joint missions called the Balloon-borne Investigation of the Temperature and Speed of Electrons in the Corona (BITSE) and COronal Diagnostic EXperiment (CODEX).

[구 SS-08] Image Translation of SDO/AIA Multi-Channel Solar UV Images into Another Single-Channel Image by Deep Learning

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We translate Solar Dynamics Observatory/Atmospheric Imaging Assembly (AIA) ultraviolet (UV) multi-channel images into another UV single-channel image using a deep learning algorithm based on conditional generative adversarial networks (cGANs). The base input channel, which has the highest correlation coefficient (CC) between UV channels of AIA, is 193 Å. To complement this channel, we choose two channels, 1600 and 304 Å, which represent upper photosphere and chromosphere, respectively. Input channels for three models are single (193 Å), dual (193+1600 Å), and triple (193+1600+304 Å), respectively. Quantitative comparisons are made for test data sets. Main results from this study are as follows. First, the single model successfully produce other coronal channel images but less successful for chromospheric channel (304 Å) and much less successful for two photospheric channels (1600 and 1700 Å). Second, the dual model shows a noticeable improvement of the CC between the model outputs and Ground truths for 1700 Å. Third, the triple model can generate all

other channel images with relatively high CCs larger than 0.89. Our results show a possibility that if three channels from photosphere, chromosphere, and corona are selected, other multi-channel images could be generated by deep learning. We expect that this investigation will be a complementary tool to choose a few UV channels for future solar small and/or deep space missions.

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[구 SS-09] Denoising solar SDO/HMI magnetograms using Deep Learning

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In this study, we apply a deep learning model to denoising solar magnetograms. For this, we design a model based on conditional generative adversarial network, which is one of the deep learning algorithms, for the image-to-image translation from a single magnetogram to a denoised magnetogram. For the single magnetogram, we use SDO/HMI line-of-sight magnetograms at the center of solar disk. For the denoised magnetogram, we make 21-frame-stacked magnetograms at the center of solar disk considering solar rotation. We train a model using 7004 paris of the single and denoised magnetograms from 2013 January to 2013 October and test the model using 1432 pairs from 2013 November to 2013 December. Our results from this study are as follows. First, our model successfully denoise SDO/HMI magnetograms and the denoised magnetograms from our model are similar to the stacked magnetograms. Second, the average pixel-to-pixel correlation coefficient value between denoised magnetograms from our model and stacked magnetogrmas is larger than 0.93. Third, the average noise level of denoised magnetograms from our model is greatly reduced from 10.29 G to 3.89 G, and it is consistent with or smaller than that of stacked magnetograms 4.11 G. Our results can be applied to many scientific field in which the integration of many frames are used to improve the signal-to-noise ratio.

[구 SS-10] Solar Rotational Tomography Using the Filtered Backprojection Algorithm

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Tomography is a method to reconstruct three-dimensional structure of an optically thin object. We can obtain the three-dimensional information by combining a number of projected images at different angles. Solar rotational tomography (SRT) is the tomographic method to estimate the coronal structures using the solar rotation. There are a few practical difficulties in solar coronal observation. One of the most crucial difficulty is handling the blocking area by the occulter or the Sun itself. So we have to use the iterative reconstruction for the SRT which can resolve that problem by using the forward modeling. In this study, we propose an alternative method to reconstruct the solar coronal structure: the filtered backprojection (FBP) algorithm. The FBP algorithm is based on the simple analytic solution. Thus it is easy to understand, and the computing cost is much cheaper than that of the iterative reconstruction. Recently we found a solution for the FBP algorithm to the problem of the blocking area in the solar EUV observations. We introduce how to apply the FBP algorithm to the SRT, and show the initial results of the performance test.

[구 SS-11] Mass estimation of halo CMEs using synthetic CMEs based on a full ice-cream cone model

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A coronal mass ejection (CME) mass is generally estimated by the total brightness measured from white-light coronagraph observations. The total brightness are determined from the integration of the Thomson scattering by free electrons of solar corona along the line of sight. It is difficult to estimate the masses of halo CMEs due to the projection effect. To solve this issue, we construct a synthetic halo CME with a power-law density distribution ($\rho = \rho_0 r^{-3}$) based on a full ice-cream cone model using SOHO/LASCO C3 observations. Then we compute a conversion factor from observed CME mass to CME mass for each CME. The final CME mass is determined as their average value of several CME masses above 10 solar radii. Our preliminary analysis for six CMEs show that their CME mass are well determined within the mean absolute relative error in the range of 4 to 15 %.

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