(Small scale magNespheric and Ionospheric Plasma Experiment) mission, formation flying CubeSat constellation. Observing particles and waves on a single satellite suffers from inherent space-time ambiguity. To observe spatial and temporal variations of the micro-scale plasma structures on the topside ionosphere, four 6U CubeSats (~ 10 kg) will be launched into a polar orbit of the altitude of ~500 km in 2021. The distances of each satellite will be controlled from 10 km to more than 100 km by formation flying algorithm. The SNIPE mission is equipped with identical scientific instruments, solid-state telescope, magnetometer, and Langmuir probe. All the payloads have a high temporal resolution (sampling rates of about 10 Hz). Iridium modules provide an opportunity to upload changes in operational modes when geomagnetic storms occur. SNIPE's observations of the dimensions, occurrence rates, amplitudes, and spatiotemporal evolution of polar cap patches, field-aligned currents (FAC), radiation belt microbursts, and equatorial and mid-latitude plasma blobs and bubbles will determine their significance to the solar wind-magnetosphere-ionosphere interaction and quantify their impact on space weather.

[포 AT-03] Status and Plan of KMTNet Operation

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외계행성 탐색시스템 2020년 운영현황과 2021년 계획을 보고한다. 2020년은 코로나-19 팬데믹으로 인해 칠레와 남아공 관측소에서는 3월 중순부터 관측이 중단된 바 있으나, 연말부터 재가동을 시작하여 2021년 현재 3개 관측소가 모두 정상가동하고 있다. 2020년 관측장비 가동율은 99.3% 이었다. 천문박명시간 기준으로 5877.2 시간이 할당되었고, 이중 4069.7 시간 동안 관측이 이루어져 관측율은 75.2% 이었다. 이 발표에서는 2020년 날씨통계 및 주요 관측 장비의 성능 개선과 함께 2021년 관측 및 시스템 개선 계획을 소개한다.

[포 AT-04] KPDS user interface and science data transfer sequence for scientists and public users in Korea Lunar Exploration Program

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현재 우리나라는 달탐사 개발 사업을 통하여 2022년 8월 발사를 목표로 달 궤도선인 KPLO와 과학임무 및 기술검증 임무를 수행하게 될 임무 탑재체, 임무 수행을 위한 각종 소프트웨어의 개발, 궤도/궤적의 설계 등 일련의 개발 과정을 순조롭게 수행하고 있다. 또한 달 궤도선인 KPLO와 이들 탑재체에 대한 운영과 관제를 수행하는 KPLO 심우주 지상국도 일정에 따라 개발 막바지에 접어들고 있다. 특히 KPLO 심우주 지상국에는 우리나라 대학과 정부출연연구소에 의해서 개발되는 과학탑재체 4기가 달 궤도에서 과학임무를 수행하여 얻게되는 달 탐사 과학자료, 즉, 과학임무자료를 달 탐사에 직접 참여하는 과학자들뿐만 아니라 일반인들도 교육 및 연구에 활용할 수 있도록 달 탐사 과학자료의 저장, 공개, 관리를 위한 Archive system인 KARI Planetary Data System(KPDS)도 함께 개발되고 있다. KPDS는 전문 연구자와 일반인들이 별도의 교육없이 인터넷을 통하여 쉽게 접속하여 KPLO의 과학탑재체가 획득한 달 탐사 과학자료를 검색하여 내려받아 사용할 수 있도록 서비스를 제공할 예정이다. 본 논문에서는 과학탑재체 개발기관 소속의 연구자가 달 탐사 과학자료에 대한 검보정 처리와 과학적 분석을 수행하기 위해서 텔레메트리 형태의 원본형태의 과학자료를 KPDS로부터 다운로드 받는 과정과 검보정 처리가 된 과학자료를 일반 사용자들이 내려 받아 사용할 수 있도록 과학자료가 공개되기까지 일련의 과정을 설명하고, 연구자 및 일반사용자가 직접 접하게 되는 KPDS의 주요한 사용자 환경에 대해서 설명한다.

태양/태양계

[포 SS-01] Triggering processes of two different eruptive events in active region 11283 using observation-based models

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An investigation of flare-producing magnetic structure is important for studying an initiation of eruptive events. In this study we select two different eruptive events, M5.3 and X1.2 flares in active region (AR) 11283. Both events occur in the same AR, but brightenings of flare ribbons, seen in EUV images, are different shapes. In order to understand triggering process of eruptive flares, we reconstruct coronal magnetic fields using two observation-based models: a nonlinear force-free field (NLFFF) extrapolation model and a magnetohydodynamic (MHD) one. The NLFFFs show that sheared arcades and overlying fan-spine configurations are found in both cases, but the distributions of magnetic twist are weaker before the M5.3 flare than before the X1.2 flare. The MHD model is to explore the temporal evolution of coronal magnetic structures by considering the NLFFF with an anomalous resistivity as an initial condition. We discuss possible processes of two

eruptive events using the MHD as well as the NLFFF model results.

[포 SS-02] BITSE Preliminary Results

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The Balloon-borne Investigation of Temperature and Speed of Electrons in the corona (BITSE) is a technology demonstration mission launched in 2019 to observe the solar corona from ~3 Rs to 15 Rs at four wavelengths (393.5, 405.0, 398.7, and 423.4 nm). Preliminary analysis shows that BITSE imaged the solar minimum corona with the equatorial streamers on the east and west limbs. The narrow streamers observed by BITSE are in good agreement with the geometric properties obtained by the Solar and Heliospheric Observatory (SOHO) coronagraphs in the overlapping physical domain. In spite of the small signal-to-noise ratio we were able to obtain the temperature and flow speed of the western steamer. In the heliocentric distance range 4 – 7 Rs on the western streamer, we obtained a temperature of ~ 1.0 ± 0.3 MK and a flow speed of ~ 260 km s^{-1} with a large uncertainty interval.

[포 SS-03] Can AI-generated EUV images be used for determining DEMs of solar corona?

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In this study, we determinate the differential emission measure(DEM) of solar corona using three SDO/AIA EUV channel images and three AI-generated ones. To generate the AI-generated images, we apply a deep learning model based on multi-layer perceptrons by assuming that all pixels in solar EUV images are independent of one another. For the input data, we use three SDO/AIA EUV channels (171, 193, and 211). For the target data, we use other three SDO/AIA EUV channels (94, 131, and 335). We train the model using 358 pairs of SDO/AIA EUV images at every 00:00 UT in 2011. We use SDO/AIA pixels within 1.2 solar radii to consider not only the solar disk but also above the limb. We apply our model to several brightening patches and loops in SDO/AIA images for the determination of DEMs. Our main results from this study are as follows. First, our model successfully generates three solar EUV channel images using the other three channel images. Second, the noises in the AI-generated EUV channel images are greatly reduced compared to the original target ones. Third, the estimated DEMs using three SDO/AIA images and three AI-generated ones are similar to those using three SDO/AIA images and three stacked (50 frames) ones. These results imply that our deep learning model is able to analyze temperature response functions of SDO/AIA channel images, showing a sufficient possibility that AI-generated data can be used for multi-wavelength studies of various scientific fields.

SDO: Solar Dynamics Observatory
AIA: Atmospheric Imaging Assembly
EUV: Extreme Ultra Violet
DEM: Diffrential Emission Measure

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기타

[포 HA-01] Current Status and Future Prospects of Korean VLBI Network (KVN)

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