spectroscopic observations were understood via spectroscopic measurements on nuclei, atoms, and molecules. Recently, computational astrophysics plays a role of bridging experimental data to observations, in particular via numerical modeling of complex astronomical phenomena. This presentation focuses on computational nuclear astrophysics that connects experimental data on nuclei to high-energy observation data obtained by X-ray and gamma-ray telescopes. As an example case, X-ray burst will be discussed. In this phenomenon, observed X-ray light curves and spectra can be modeled by stellar evolution calculations that take nuclear reactions of rare isotopes as input information. This presentation also works as an introduction to the following presentation that will provide more detailed discussion on the experimental aspect of X-ray burst.

[초 LA-04] Understanding Explosive Stellar Events Using Rare Isotope Beams

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Nuclear reactions in explosive stars such as novae, X-ray bursts, and supernovae are responsible for producing many of the elements that make up our world. Exotic nuclei not normally found on earth can play an important role in these events due to the extreme conditions that occur in the explosion. A frontier area of research involves utilizing beams of radioactive nuclei to improve our understanding of these explosions and the implications on cosmic element production. At the future radioactive ion beam facility of Korea, RAON, we will measure astrophysically important reactions using exotic beams to probe the details of cosmic events. Details of RAON and possible day-1 experiments at the facility will be presented.

TOWARD NEXT GENERATION CORONAGRAPH

[구 TG-01] TOWARD NEXT GENERATION SOLAR CORONAGRAPH: DEVELOPMENT OF COMPACT DIAGNOSTIC CORONAGRAPH ON ISS

Kyungsuk Cho[1,2], Suchan Bong[1], Seonghwan Choi[1], Heesu Yang[1], Jihun Kim[1], Jihye Baek[1], Jongyeob Park[1], Eun-Kyung Lim[1], Rok-Soon Kim[1], Sujin Kim[1], Yeon-Han, Kim[1], Young-Deuk Park[1], S.W. Clarke[3], J.M. Davila[4], N. Gopalswamy[4], V. M. Nakariakov[5], B. Li[6], and R. F. Pinto[7]
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The Korea Astronomy and Space Science Institute plans to develop a coronagraph in collaboration with National Aeronautics and Space Administrative (NASA) and install it on the International Space Station (ISS). The coronagraph is an externally occulted one stage coronagraph with a field of view from 2.5 to 15 solar radii. The observation wavelength is approximately 400 nm where strong Fraunhofer absorption lines from the photosphere are scattered by coronal electrons. Photometric filter observation around this band enables the estimation of 2D electron temperature and electron velocity distribution in the corona. Together with the high time cadence (< 12 min) of corona images to determine the geometric and kinematic parameters of coronal mass ejections, the coronagraph will yield the spatial distribution of electron density by measuring the polarized brightness. For the purpose of technical demonstration, we intend to observe the total solar eclipse in 2017 August for the filter system and to perform a stratospheric balloon experiment in 2019 for the engineering model of the coronagraph. The coronagraph is planned to be installed on the ISS in 2021 for addressing a number of questions (e.g. coronal heating and solar wind acceleration) that are both fundamental and practically important in the physics of the solar corona and of the heliosphere.

[구 TG-02] Development of DIagnostic Coronagraph Experiment (DICE) for Total Solar Eclipse

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Korea Astronomy and Space Science Institute (KASI) is developing a coronagraph in collaboration with National Aeronautics and Space

Administration (NASA) which will be installed on the International Space Station (ISS). The coronagraph can measure speed and temperature by using four filters approximately 400 nm and polarization filter in three different angles, differently with older coronagraphs. For the successful mission, it has development and experiment progress in three phases; total solar eclipse experiment in 2017, balloon experiment in 2019, and the ISS installation in 2021. As a first experiment, we developed a coronagraph without an occulter named with Diagnostic Coronagraph Experiment (DICE) for experiment for filter system and imaging sensor. We designed optics with a field of view from 2.5 to 15 solar radii. It has four filters approximately 400 nm and polarizer to measure speed and velocity of the solar corona. For the selection of filter or polarization angle, it has two mechanism parts; filter wheel assembly and a polarizer wheel assembly. Especially we used Core Flight System (CFS) platform which was developed by NASA, when we develop the coronagraph operation software. It provides us stability, reusability, and compatibility.

[구 TG-03] Simulation and Experiment Study of the Cylindrical Occulter with Tapered Surface for the Solar Compact Coronagraph (소형 코로나그래프 개발을 위한 원통형 차폐기 성능 실험)

Heesu Yang, Kyungsuk Cho, Suchan Bong, Sunghwan Choi, Jihun Kim, Jihye Baek, Jongyeob Park
Korea Astronomy and Space Science Institute

태양의 코로나를 관측하기 위한 코로나그래프의 가장 중요한 부분은 태양 원반으로부터의 빛을 차단하기 위한 차폐기다. 태양 원반 밝기의1e-6 - 1e-10에 이르는 어두운 외부 코로나(>2Rs)를 관측하기 위해서는 외부차폐기에서 발생하는 회절광을 최소화 하는 것이 중요하다. 우리는 수치실험과 실험실 실험을 통해 원통형 차폐기의 성능을 조사하였다. 수치실험 결과2.5Rs영역을 가리는 원통형 차폐기의 경우0.4um의 파장대역에 대해서 그 벽면 각도가 0.39도일 때 차폐기에 의한 회절광이1e-10Is로 최소가 되었다. 우리는 중국 산동대학교 암터널 실험실에서 시뮬레이션과 일치하는 실험결과를 얻었는데 그 회절광량은 이상적인 경우보다는 조금 더 밝은1e-9Is 수준이었다. 1e-9Is의 회절광량은 일정 간격으로 배치된9장을 겹쳐놓은 차폐기의 이론적인 성능과 비슷한 값으로 외부차폐기/내부차폐기/리오트 스탑/리오트 스팟 등으로 복잡하고 긴 구조의 코로나그래프가 아닌 외부차폐기만을 이용한 짧은 광학계의 소형 코로나그래프로 외부 코로나 관측이 가능함을 보여준다.

[구 TG-04] 2017 Total Solar Eclipse Expedition of KASI

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Korea Astronomy and Space Science Institute (KASI) plans to develop a coronagraph to measure the coronal electron density, temperature, and speed using four different filters around 400 nm, where strong Fraunhofer lines from the photosphere are scattered by coronal electrons. During the total solar eclipse occurring on August 21 across USA, KASI will organize an expedition team to demonstrate the coronagraph measurement scheme and the instrumental technology. The observation site is in Jackson Hole, Wyoming, USA. We plan to build two coronagraphs without occulter to improve signal to noise ratio. In addition, images of white light corona, wide field background, and all sky are planned to be taken with DSLR cameras. We will present the preliminary results of the expedition.

[구 TG-05] Plasma Outflows along Post-CME Rays

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Bright rays are often observed after coronal mass ejections (CMEs) erupt. These rays are dynamical structures along which plasmas move outward. We investigated the outflows along the post-CME rays observed by the COR2 on board STEREO Behind on 2013 September 21 and 22. We tracked two CMEs, two ray tips, and seven blobs using the NAVE optical flow technique. As a result, we found that the departure times of blobs and ray tips from the optimally chosen starting height of 0.5 $R_\odot$ coincided with the occurrence times of the corresponding recurrent small flares within 10 minutes. These small flares took place many hours after the major flares. This result supports a magnetic reconnection origin of the outward flows along the post-CME ray and the importance of