efficiency of the particle injection and acceleration to previous levels, starting the same series of events in an ongoing cycle of increasing and decreasing particle acceleration.

[구 HT-03] X-ray properties of PWNe measured with the NuSTAR telescopes

Hongjun An
Department of Astronomy and Space Sciences, Chungbuk National University, Republic of Korea

Young pulsar wind nebulae, powered by energetic central pulsars, are often observed as bright extended sources in the X-ray band. They are believed to accelerate electrons and positrons to very high energy and can possibly explain the positron excess observed by Fermi and AMS. The electron distribution in these PWNe can be best studied by X-ray satellites because emission in the X-ray band is produced by direct synchrotron radiation of the electrons and positrons. We present NuSTAR studies of PWNe and discuss the implication. Future studies to help further our understanding of particle acceleration will be briefly discussed.

[구 HT-04] Pair-wise peculiar velocity and the redshift space distortion

Hyunbae Park[1], Motonari Tonegawa[2], Yi Zheng[2], Cris Sabiu[3], Xiao-dong Li, Changbom Park[2]
[1]*Korea Astronomy and Space Science Institute*
[2]*Korean Institute for Advance Study*
[3]*Yonsei University*

The line-of-sight component in the relative motion of galaxy pairs sources the redshift space distortion (RSD) in galaxy surveys. By knowing the probability density function (PDF) of pair-wise motions and projecting it to the line-of-sight direction, one can compute the RSD effect precisely. I present the pair-velocity PDF of dark matter and galaxies in the Horizon-run 4 simulation. I also derive a model motivated by the perturbation theory which fits the results fairly well. I also discuss the application of the model in constraining the cosmology.

[석 HT-05] PWN SED modeling: stationary and time-dependent leptonic scenarios

Seung-jong Kim, Hong-jun An
Chungbuk National University

We develop a model for broadband spectral energy distribution (SED) of Pulsar Wind Nebulae (PWNe). The model assumes that electrons/positrons in the pulsar wind are injected into and stochastically accelerated in the pulsar termination shock. We consider two scenarios: a stationary one-zone case and a time-evolving multi-zone case. In the latter scenario, flow properties in the PWNe (magnetic field, bulk speed) are modeled to vary in time and space. We apply the model to the broadband SED of the pulsar wind nebula 3C 58. From the modeling, we find that a broken power-law injection is required with the maximum electron energy of ~200 TeV.

천문우주관측기술

[구 AI-01] Korean 8m Class Optical Facility: Gemini Observatory

Narae Hwang, Minjin Kim. Soung-Chul Yang, Ho-Gyu Lee, Jae-Joon Lee, In-Soo Yuk, Yun-Kyeong Sheen, Byeong-Gon Park
Korea Astronomy and Space Science Institute (한국천문연구원)

As of July 24th 208, Korea Astronomy and Space Science Institute (KASI) has entered into a formal partnership with the Gemini Observatory. The Gemini Observatory has been operated by Association of Universities for Research in Astronomy (AURA) on behalf of the International Partnership that includes Argentina, Brazil, Canada, Chile, United States, and Korea as the new partner country. Effective from the 209A Call for Proposals (CfP), any researchers affiliated with Korean institutes are eligible to apply for various observing opportunities in both hemispheres covered by Gemini North in Hawaii and by Gemini South in Chile. We are going to share the importance and long-term perspectives of the KASI-Gemini Partnership in the context of the next decade of Korean optical astronomy researches.

[구 AI-02] Development Plan for Immersion Grating High-Dispersion Infrared Spectrographs (담금격자 적외선 고분산 분광기 개발 계획)

Sungho Lee, Chan Park, Narae Hwang, Sanghyuk Kim, Jae-Joon Lee, Ueejeong Jeong, In-Soo Yuk, Byeong-Gon Park

[1]*Korea Astronomy and Space Science Institute*

한국천문연구원은 미국 텍사스대학교(UT)와 협력하여 2009년부터 2013년까지 IGRINS 분광기를 개발하였다. IGRINS는 UT의 맥도널드(McDonald) 천문대 2.7미터 망원경과 로웰(Lowell) 천문대의 4.3미터 망원경, 제미니(Gemini) 천문대 8.1미터 망원경에 장착하여 성공적으로 사용되어 왔으며, 최근 한국천문연구원이 제미니 천문대 운영에 정식으로 참여하면서 IGRINS와 유사한 관측기기를 8.1미터 망원경 전용으로 개발해 달라는 요청을 받고 개발계획을 준비하고 있다.

담금격자(immsersion grating)를 사용하는 IGRINS는 거대마젤란망원경(GMT)의 1세대 관측기기 중 하나로 선정된 적외선 고분산 분광기 GMTNIRS의 핵심 요소기술을 검증하기 위한 선행개발 기기의 의미도 갖고 있다. 한국천문연구원은 2011년 UT와 공동으로 GMTNIRS의 개념설계를 수행하였으며, 이후 개발팀에 카네기(Carnegie) 천문대가 합류하여 6.5미터 마젤란(Magellan) 망원경용으로 GMTNIRS와 유사한 담금격자 적외선 분광기를 개발하고 시험운영함으로써 GMTNIRS의 개발을 앞당기는 계획을 추진 중이다.

[구 AI-03] The first results of 1-m telescope imaging at SNU Astronomical Observatory (SAO)

Gu Lim, Myungshin Im, Jinguk Seo, and Gregory SungHak Paek
Astronomy Program, Department of Physics & Astronomy, Seoul National University

Since its installation on March 27th, 2018, the SAO 1-m telescope has been operating for about 5 months. We report first results of these observations in this presentation. Sample images were taken with a 4096x4096 CCD camera (Field of view of ~21x21 arcmin^2) and their characteristics such as seeing value, and limiting magnitudes are presented. The best seeing value is 0.85 arcsecond on July 16th, 2018. We find that the 5 sigma detection limit is about 20 magnitude AB in B, V, R, I bands with about 10-20 min exposures. We will also briefly introduce the spectrum of a faint transient taken with the spectrograph also installed on the SAO 1-m telescope.

[구 AI-04] Efficiency estimation of ASTE receiver optics using measured beam patterns from KASI band 7+8 feed horn

Bangwon Lee[1,2], Jung-won Lee[1], Hyunwoo Kang[1], Do-Heung Je[1]
[1]*Korea Astronomy & Space Science Institute,* [2]*Seoul National Univ.*

We conducted efficiency calculation in a prototype receiver optics for ASTE 10 meter telescope using the measured beam patterns of the band7+8 feed horn.

Beam measurements results are summarized and estimated aperture efficiencies over band7+8 frequency range are presented.

태양/태양계

[구 SS-01] Optical Characteristics of Impact Craters on Mercury

Chae Kyung Sim, Sungsoo S. Kim
School of Space Research, Kyung Hee University

수성의 대기와 자기장은 매우 희박하여 그 표면이 우주환경에 거의 그대로 노출되어있다. 표면의 토양은 태양풍 입자와 미소유성체 등에 의해 계속해서 밝기가 어두워지고 입자의 크기도 작아진다. 이러한 현상을 종합적으로 '우주풍화'(space weathering)라고 부르는데, 그 정도를 정량화하거나 상대적으로 평가하는 데에는 어려움이 따른다. 왜냐하면 우주풍화의 정도에는 원인이 되는 입자의 입사 플럭스는 물론이고, 표면의 지역 조성비와 토양의 노화도 등이 모두 섞여 영향을 미치기 때문이다. 이를 극복하는 한 가지 방법은 수성 표면을 뒤덮고 있는 수많은 충돌구(impact crater) 내의 광학적 특성 분포를 통계적으로 분석하는 것이다. 충돌구 안쪽의 토양은 충돌 시점에 동시에 형성되었고, 그 성분이 충돌구 밖 임의의 지역에 비교해 상대적으로 균질하며, 지형적으로 충돌구 안팎의 경계가 분명하게 정해져 있다. 또한, 충돌구는 수성 전구(全球)에 걸쳐 어디에서나 발견되므로 각 충돌구의 특성을 경도·위도·연대 등 여러 측면에서 조사할 수 있다. 본 연구에서는, 메신저(MESSENGER) 탐사선의 MDIS 영상기에서 얻은 관측 자료를 활용하여 수성 충돌구의 광학적 특성에 대해 알아본다.

[구 SS-02] The Geometric Albedo of (4179) Toutatis

Yoonsoo P. Bach[1], Masateru Ishiguro[1], Sunho Jin[1], Hongu Yang[2], Hong-Kyu Moon[2], Young-Jun Choi[2], Youngmin JeongAhn[2], Myung-Jin Kim[2], Sungwon Kwak[2]
[1]*Department of Physics and Astronomy, Seoul National University, Gwanak-ro 1, Gwanak-gu, Seoul, Republic of Korea (08826),* [2]*Korea Astronomy and Space Science Institute 776, Daedeokdae-ro, Yuseong-gu, Daejeon, Republic of Korea (34055)*

(4179) Toutatis (Toutatis hereafter) is one of the Near-Earth Asteroids which has been studied most