

시스템을 이용하여 독보적인 다파장 관측연구를 진행하고 있으며, 뛰어난 위상보정 성능을 바탕으로 기존의 밀리미터 대역에서 검출되지 않았던 많은 천체들을 검출하고 있다. 하지만, KVN 3기 VLBI 관측으로부터 얻어지는 천체의 합성영상(synthesized image)은 초미세구조에서 발생하는 물리 기작을 연구하기에는 한계를 지닌다. 따라서 KVN을 활용한 연구 성과를 극대화하기 위한 최적의 방안을 도출하기 위하여, KVN 확장 기획연구를 진행하였다. 본 발표에서는 KVN 확장에 따른 예상 성과와 이를 통한 과학연구를 소개한다.

**[구 HP-06] Launch of Open-Use Operation of the East-Asian VLBI Network (동아시아 VLBI 관측망 공동이용관측 시작)**

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동아시아 VLBI 관측망(East-Asian VLBI Network; EAVN)은 한-중-일 각국의 전파망원경을 통합해서 구성되는 동아시아 지역의 새로운 VLBI 네트워크이다. EAVN은 2013년부터 공동이용관측을 실시하고 있는 한일 VLBI 관측망(KaVA)을 중심으로 총 20개 전파망원경을 포함한다. 4개 주파수(6.7/8/22/43 GHz)로 관측할 수 있으며, 최대 0.6 mas (22 GHz)의 해상도로 관측할 수 있는 기능을 가지고 있다.

우리는 2017년 3월부터 5월까지 EAVN을 이용한 총 17번의 AGN 관측 캠페인을 실시하였다. 이것은 ALMA를 이용한 Event Horizon Telescope (EHT) 관측과 같은 시기에 실시되며, 총 15개의 전파망원경이 참가하였다. 이 관측을 통해서 EAVN으로 얻은 영상이 KaVA의 영상에 대해 80% 정도 성능이 개선되는 것을 확인하였다. 또한, 주된 관측천체인 M87과 Sgr A\*의 영상은 과거의 결과를 재현해서 AGN 중심 주변의 sub-pc 스케일의 제트 구조를 보다 자세히 볼 수가 있었다.

이 결과에 의거해서 우리는 KaVA의 관측시간의 일부를 이용해서 2018년 하반기부터 EAVN의 공동이용관측을 시작한다. 공개될 범위는 KaVA, 일본 Nobeyama 45 m, 중국 Tianma 65 m의 총 9개 망원경이며, 중국 Nanshan 26 m 망원경도 Large Program 관측에 한해서 참가한다. 관측주파수는 22 GHz (KaVA + Tianma) 및 43 GHz (KaVA + Tianma + Nobeyama) 이며, 오는 관측시즌(2018년 8월부터 2019년 1월까지)에 제공될 총 관측시간은 100 시간이다. 관측제안서 제출 마감날은 6월 1일이며, 많은 관측제안서가 제출될 것을 기대한다. 이 발표에서는 EAVN AGN 캠페인의 결과 및 EAVN 공동이용관측의 자세한 내용을 보고한다.

**태양**

**[구 SS-01] Polarimetric research on S- and Q-type Near-Earth Asteroids**

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Polarimetry is a powerful technique to investigate the physical properties of surface materials on airless bodies in the solar system. It is known that the degree of linear polarization changes as a function of the phase angle (the angle between Sun-target-Observer). Especially, the dependency of the polarization degree at large phase angle allows us to obtain information related to the particle size and porosity, which is difficult to be determined via other observation techniques (i.e., photometry and spectroscopy). However, despite the advantage, only a few asteroids were observed with polarimetric devices at large phase angles. Here, we present our new polarimetric research of Near-Earth Asteroids (NEAs) observed at the large phase angles. Among the NEAs, we focus on S- and Q-type asteroids, which include: (331471) 1984 QY1, (90075) 2002 VU94, and (66391) 1999 KW4. The observation was conducted using the Pirka 1.6-m Telescope at the Nayoro Observatory of Hokkaido University at the phase angles  $\alpha \sim 100$  degree, which provides us the maximum polarization degrees of these objects. Considering the observational results together with two objects ((1566) Icarus and (4179) Toutatis) in reference papers [1], [2], we will discuss the implication of the regolith size on their surfaces.

[1] Ishiguro, M., Nakayama, H., Kogachi, M., et al. 1997, PASJ, 49, L31

[2] Ishiguro, M., Kuroda, D., Watanabe, M., et al. 2017, AJ, 154, 180

**[구 SS-02] The Flow of the Interstellar Plasmas surrounding the Heliopause estimated via IBEX-Lo Observations**

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Since Voyager 1 passed the Heliopause in 2012, it has provided the observations of the charged particles in the local interstellar medium. However, Voyager 1 only provides the information along with its trajectory. In order to understand the global view of the interstellar plasma flow surrounding the Heliopause, we need another tool. When the interstellar plasmas approach the Heliopause, the ions are deflected around the Heliopause due to the draping of the interstellar magnetic field. The draping of the interstellar magnetic field is strongly connected with the shape of the Heliopause. A fraction of the diverted ions exchanges their charges with the undisturbed primary interstellar neutral atoms, and then the ions become neutral atoms called the secondary interstellar neutral atoms. The newly created neutral atoms carry information on the diverted flow of the interstellar ions, and a fraction of them can travel to the Sun. Therefore, the secondary component of the interstellar neutrals is an excellent diagnostic tool to provide important information to constrain the shape of the Heliopause. The secondary interstellar neutrals are observed by Interstellar Boundary Explorer (IBEX) at Earth's orbit. Since 2009, two energetic neutral atom cameras on IBEX have measured neutral atoms and it has provided sky maps of neutral atoms. In this presentation, we will discuss the directional distribution of the secondary interstellar neutrals at Earth's orbit. In the sky maps, the primary interstellar neutral gas is seen between  $200^\circ$  and  $260^\circ$  in ecliptic longitude and the secondary components are seen in the longitude range of  $160^\circ$ - $200^\circ$ . We also present a simplified model of the outer heliosheath to help interpret the observations of interstellar neutrals by the IBEX-Lo instruments. We extract information on the large-scale shape of the Heliopause by comparing the neutral flux measured at IBEX along four different look directions with simple models of deflected plasma flow around hypothetical obstacles of different aspect ratios to the flow. Our comparisons between the model results and the observations indicate that the Heliopause is very blunt in the vicinity of the Heliospheric nose, especially compared to a Rankine half-body or cometary shape.

### [7 SS-03] The role of heliospheric current sheet on solar energetic particles with enhanced Fe/O

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We investigate initial Fe/O enhancements for 44 large gradual solar energetic particles events from 2010 to 2014 and examine the associations of the Fe/O enhancements with the structures of the heliospheric current sheet (HCS). For this study, we use STEREO SIT Fe and O data in 0.32-0.45 MeV channel as well as ACE ULEIS Fe and O data in 0.32-0.64 MeV channel. We determine 1) the magnetic polarities of the SEP source regions using the potential field source surface (PFSS) model of the coronal field and 2) the spacecraft magnetic footpoints with Parker spiral approximation of interplanetary magnetic field using the in-situ measurements of STEREO and ACE. We find that 29 out of 44 events have initial Fe/O enhanced more than 5 times of the typical gradual event values. In the 6 events, the enhancements are simultaneously observed by two spacecraft. There is a tendency that the high Fe/O enhancements are observed near SEP source regions. It is also noted that the Fe/O enhancements are associated with the polarity of the magnetic footpoints. The high Fe/O enhancements are usually observed where their footpoints lie in the same polarity regions of SEP sources rather than the opposite polarity regions. Although Fe/O enhancements could be due to a transport effect and/or a flare contribution, our result implies that the structure of HCS is likely to affect particle propagations in the interplanetary space.

### [7 SS-04] A Solar Stationary Type IV Radio Burst and Its Radiation Mechanism

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