observation by VLBA (Kellermann et al. 1998). This might indicate episodic-jet activity which recently turned on.

This object currently shows two stationary compact parsec-scale components which are bright jet component on east and less luminous core on west. Also, it is known that there have been superluminal jet components which are flowing from the core toward east, and then merging with the bright jet component (Marscher et al. 1991, Alberdi et al. 2000, Lister et al. 2013). Although 4C39.25 seems to be a blazar-like source having broad emission lines (SDSS) and superluminal motion, its property that jet component is brighter than the core is different from ordinary blazars. Furthermore, it has young radio galaxy-like properties such as non-variation in total flux (Alberdi et al. 1997, 2000, MOJAVE database) and high frequency peak at spectral energy distribution (Orienti et al 2007). Such complex properties led us to make recent observations to reveal precise properties and new changes of the source.

We used Korean VLBI Network (KVN) and VLBI Exploration of Radio Astronomy (VERA) Array (KaVA) which provide high-frequency (23GHz and 43GHz) and high spatial resolution (1.2mas and 0.6mas). Therefore, this system is suitable for morphological and physical research on parsec scale structure. We present results for several epochs observed during 2013 to 2014, mainly focusing on morphological changes of 4C39.25 using KaVA images.

[구 AGN-03] Proving the Evolution of Relativistic Jet of Radio-Loud AGN, OVV 1633+382

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It is suggested that relativistic jets associated with active galactic nuclei (AGNs) can have great impacts on the evolution of the host galaxy. However, the physical properties of AGN jets including the formation mechanism are not well known to date, and hence the AGN feedback on the host galaxy is yet poorly understood. OVV 1633+382 as a highly variable AGN source (a.k.a. blazer) with a compact core and very well developed jet components is an excellent laboratory to study the jet formation mechanism of radio-loud AGN. Near 2002, a major flare was reported at mm wavelength with a dramatic increase of the flux, which is likely to be followed by a dense and bright outflow. In order to probe the evolution of the innermost region of this radio-loud AGN, we have monitored using the Very Large Baseline Array (VLBA) and the Effelsberg 100m single-dish radio telescope in 12 epochs from 2002 and 2005. The observations were conducted at 22, 43 and 86 GHz in full polarization mode. In this work, we present the intensity and spectral index maps at 22 and 43 GHz from our monitoring observations. We probe the kinematics and geometry of individual jet components to discuss the evolution of the jet.

[구 AGN-04] Testing the Geometry of AGN Tori through the Fraction of Optically-Selected Type 1 AGNs

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According to the unified model of AGNs, type 1 and 2 AGNs are intrinsically the same objects but seem different due to an obscuring matter which can block lights from the central engine of the AGN depending on the viewing angle. The obscuring object is thought to be shaped in a toroidal form and thus the geometry of tori of AGNs is an important factor to determine the fraction of type 1 (or type 2) AGNs. Oh et al. (2015) provides a new catalog of type 1 AGNs from SDSS DR7 in the nearby universe ($z < 0.2$) and it contains nearly 50% more type 1 AGNs than previously known. Using this new catalog, we test the fraction of type 1 AGNs along the black hole mass (MBH) and the bolometric luminosity of AGNs (Lbol), which are regarded as key parameters of the AGNs. First of all, because the methods to derive the black hole mass and the bolometric luminosity bear uncertainties, we test how the different methods lead to different values of type 1 fraction. We found that the fraction of type 1 AGNs varies with both MBH and Lbol. The extensively-studied, “receding torus model” can only explain the trend along Lbol and hence fails to explain the trend. To understand the new trend, we test the geometry of the torus based on the “clumpy torus model”. We present our results on the basic properties of the torus such as a column

density or opening angle and compare with those from previous studies based on other wavelengths (e.g. Infrared or X-ray).

이론/고에너지/고천문학

[박 HA-01] Diffusion of Cosmic Rays in a Multiphase Interstellar Medium Shocked by a Supernova Remnant Blast Wave

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Supernova remnants (SNRs) are one of the most energetic astrophysical events and are thought to be the dominant source of Galactic cosmic rays (CRs). A recent report on observations of gamma rays from the vicinity of SNRs have shown strong evidence that Galactic CR protons are accelerated by the shock waves of the SNRs. The actual gamma-ray emission from pion decay should depend on the diffusion of CRs in the interstellar medium. In order to quantitatively analyze the diffusion of high-energy CRs from acceleration sites, we have performed test particle numerical simulations of CR protons using a three-dimensional magnetohydrodynamics (MHD) simulation of an interstellar medium swept-up by a blast wave. We analyse the CRs diffusion at a length scale of order a few pc, and show the Richtmeyer-Meshkov instability can provide enough turbulence downstream of the shock to make the diffusion coefficient close to the Bohm level for energy larger than 30 TeV for a realistic interstellar medium.

[구 HA-02] Toward the Development of a New MHD Code for Fusion Plasma

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Development of a new code for magnetohydrodynamic (MHD) phenomena in fusion plasma is under progress through a collaboration between plasma physicists, mathematicians, and astrophysicists. The code employs approaches different from those of existing codes. For instance, it is based on a finite difference scheme of high-order and high accuracy, complying conservation laws. The new code will have characteristics distinguished from those of commonly used code such as M3D and NIMROD. Here we will report the progress of the code development.

[구 HA-03] Influence of the Galactic Magnetic Field on the Distribution of Ultra-high-Energy Cosmic Rays

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Recently, the Pierre Auger Observatory (PAO), the largest ground-based project for detecting ultra-high-energy cosmic rays (UHECRs), published their 10-year data. We can access an unprecedented number of UHECR data observed by the project, which give us a possibility to get an accurate statistical test result. In this work, we investigate the influence of the galactic magnetic field (GMF) on the distribution of UHECRs by searching the correlation with the large-scale structure (LSS) of the universe. We simulate the mock UHECR events whose trajectories from the sources would be deflected by the Gaussian smearing angle which reflects the influence by the GMF. By the statistical test, we compare the correlation between the expected/observed distribution of UHECRs and the LSS of the universe in the regions of sky divided by the galactic latitude, varying the smearing angle. Here, we assume the deflections by the GMF are mainly dependent on the galactic latitude. Using the maximum likelihood estimation, we find the best-fit smearing angle in each region. If we get a trend that best-fit smearing angles differ from each region, the influence of GMF may be stronger than that of intergalactic magnetic fields (IGMF) because it is known that the distribution of IGMF follows the LSS of the universe. Also, we can estimate the strength of the GMF using the best-fit parameter by the maximum likelihood.

[구 HA-04] KaVA Q-band Monitoring of Sgr A* in 2013-2014

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