Japanese VLBI activities- VERA and VSOP-2

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Japan has many activities related to VLBI researches. Currently two major projects, VERA and VSOP-2, are carried out. VERA is the first VLBI array for simultaneous phase referencing. It has a two-beam system, which make two celestial objects observations simultaneously. The two-beam separation angle is allowed from 0.3 degree to 2.2 degree. One object must have enough intensity for fringe detections. The other object is applied fringe parameters and residual phases for the phase calibrations. Then accurate separation angle between two objects can be determined. VERA aims precise astrometry measurements between extragalactic object and galactic maser object. And it make possible to determine the distance by the trigonometric parallax measurements. VERA has four VLBI stations with 20-m diameter telescope. Observation bands are 22 and 43 GHz, which are related to H_2O maser and SiO maser emissions. VERA has achieved the trigonometric accuracy with 10 micro-arc-second, which makes possible to measure the distance of the galactic center with 10% accuracy. As a project goal, VERA aims to make a precise map of the galaxy based on the trigonometric parallax measurements of more than 500 galactic maser objects. VERA has already measured the distance for around 20 objects from 100pc to 5000pc. The scientific goal of VERA is to reveal the precise structure and kinematic field of the Milky way galaxy. And they must be related to the dark matter distribution in it.

Another major activity is a space VLBI satellite development project, which is called as VSOP-2. In 1997, Japan launched the first space VLBI satellite, HALCA. Follow-up satellite developments have started from 2007 by ISAS, which is called as Astro-G satellite. Astro-G has 9.3-m radio telescope with 43, 22, and 8GHz receivers. Apogee height is 25,000 km, which makes 35 micro-arc-second spatial resolutions at 43GHz. Astro-G will be launched in 2013. Major science goals are as follow. The structures and magnetic field configuration of accretion disks in active galactic nuclei will be revealed and the mechanism of jet acceleration and collimation also is expected to be revealed. And precise motions of galactic and extragalactic H_2O and SiO maser objects will be observed.

Moreover Japan has 13 ground VLBI stations including VERA stations. These stations are organized as Japan VLBI network, which is operated at 22, 8 and 6.7 GHz. And China has 4 VLBI stations at Shanghai, Urumqi, Kunming and Beijing. Korea is constructing three VLBI stations, which will be operated up to 129 GHz. These stations are organized as East Asia VLBI network. One of important target is used as a ground array for VSOP-2. We will present these Japanese VLBI activities.