

CARAVAN-SUBMM, A FISRT BLACK HOLE IMAGER AT ANDES

M. Miyoshi¹, T. Kasuga², J. K. Ishitsuka Iba³, T. Oka⁴, M. Sekido⁵, K. Takefuji⁵, M. Takahashi⁶, H. Saida⁷, and R. Takahashi⁸

We introduce our Peruvian-Japanese black hole imaging project, Caravan-submm at Andes. By constructing a sub-millimeter wavelength (submm) VLBI network at Andes we aim to get images of black hole horizon and the surroundings of Sgr A*. The array contains at least two fixed VLBI stations and one mobile VLBI station.

Japan has a dedicated plan for black hole imaging, named “Caravan-submm”, which is a project to construct a millimeter/sub-millimeter wavelength VLBI network in the Andes. In 2012, we put forward the plan, Caravan-submm to the Astronomy and Astrophysics subcommittee of Science Council of Japan (SCJ), where proposed future plans (middle size projects) were discussed openly.

The new VLBI network contains at least its own two fixed VLBI stations and one mobile VLBI station. “Mobile VLBI station” is a famous method in Japanese geodetic VLBI experiments since mid in the 1980s. We apply the method in order to cover the u-v plain effectively and attain higher quality images at submm VLBI than those only fixed stations can. For the development of low cost element antenna of 2m in diameter, we have investigated spinning method and found an accuracy of $rms15\mu m$ can be achieved. We plan to construct the fixed stations at around Huancayo Observatory, Institute of Geophysics Peru (IGP) in Peru and at the Mount

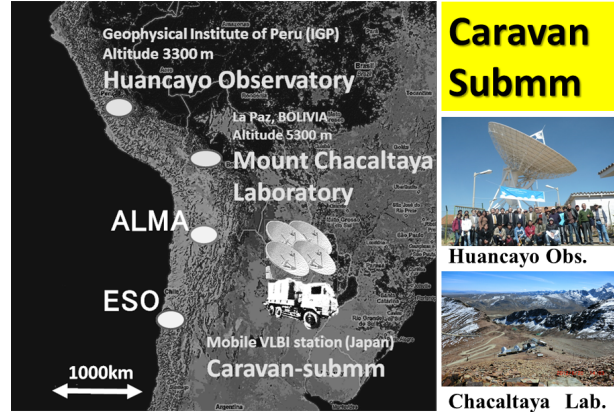


Fig. 1. Caravan-submm in the Andes. The mobile radio telescope Caravan-submm moves around Andes (Miyoshi et al. 2016).

Chacaltaya Laboratory in Bolivia. Both have sufficient facilities for researches and long friendship with Japan. Huancayo Observatory is at Huancayo Province in Peru ($12.0^{\circ}S, 75.29^{\circ}W, 3370 m$ in altitude), on the equator of the Earth’s magnetic field. The observatory is famous for observation of geomagnetism. In collaboration with the National Astronomical Observatory of Japan (NAOJ), the director, Professor Ishitsuka promotes radio astronomy with the Sicaya 32 m radio telescope. This place is also suitable for submm VLBI observations. The Mount Chacaltaya Laboratory is on the top of Mt. Chacaltaya, near La Paz in Bolivia, and is operated in collaboration with worldwide institutes ($16.35^{\circ}S, 68.13^{\circ}W, 5270 m$ in altitude). It is at the Chacaltaya Laboratory that the Yukawa’s predicted π -meson was detected in 1947. The observatory’s collaboration with Japan, namely with the Institute for Cosmic Ray Research (ICRR) at the University of Tokyo, has been ongoing since 1962 (Figure 1).

REFERENCES

Miyoshi, M., Kasuga, T., Iba, J. K. I., et al. 2016, AdAst, 2016, 9