

Project title: Study of subtle and complex volcanic deformation by sequential DS-InSAR

Dates: 15 July – 28 August, 2024

With the generous support of ERI and my host professor Yosuke Aoki, I had the opportunity to visit ERI and conduct the collaborative study on subtle and complex volcanic deformation from geodetic measurements. During my stay in ERI, we first focused on improving the distributed scattering InSAR method for the seasonal coherent scatterers, by an optimized statistical modality test and pairwise interferogram selection strategy. Second, we investigated volcanic deformation at Aluto Volcano, a peralkaline volcano located in the Central Main Ethiopian Rift, Ethiopia. Although the site has been reported for caldera unrest events, the subsurface processes remain unclear. From a deformation perspective, the features are highly complex, influenced by anthropogenic factors such as geothermal development, magma system unrest, rift-related extensional faults, and neighboring hydrological factors. We analyzed both ascending and descending tracks of Sentinel-1 data over the past decade. Preliminary results show a continuous subsidence across the caldera area, with a velocity of approximately 0.7-0.8 cm/year. We examined nearby GNSS sites, similar to the InSAR results, a continuous subsidence with seasonal deformation variations can be determined. Satellite altimetry data showed meter-level variations in the nearby Lake Ziway, though these changes alone do not seem sufficient to cause centimeter-level seasonal deformation, suggesting that surface hydrological loadings cannot fully explain the observations. We will continue to collaborate on exploring the deformation mechanism at Aluto Volcano by combining other SAR observations and a better error estimation from troposphere, topography, and phase unwrapping.

Finally, I would like to express my gratitude to the Earthquake Research Institute, Professor Aoki, peers and colleagues, and the staff at the International Office for their warm hospitality, great discussions, and excellent arrangements, which made my stay in Tokyo both productive and enjoyable.