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Three-dimensional Density Reconstruction Analysis Method for Omni-directional Muography

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Muography is the technique to observe the inner density structure of volcano by using cosmic-ray muons. In previous study, three-dimensional density reconstruction was attempted by using muography data from multiple directions (Tanaka et al., 2010, Rosas-Carbajal et al., 2017), but they could only get a few hundred meters of spatial resolution. To improve the spatial resolution, Nagahara and Miyamoto (2018) suggested omni-directional muography, putting ten or more observation points to surround the volcano.

There are two types of three-dimensional density reconstruction methods from omni-directional muography observations, the linear inversion method (Rosas-Carbajal et al., 2017) and the filtered back projection (FBP) method (Nagahara and Miyamoto, 2018). The former is applicable even when the number of observation points is small, but requires many arbitrary parameters, while the latter has the characteristic that no arbitrary parameters are required but a certain number of observation points is required.

In this presentation, we show the results of a comparison between the two methods in simulation.