

Evolution of the hydrothermal system model beneath the central part of Kuju volcano

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One of the most active fumarolic fields in Japan is situated in the central part of Kuju volcano, western part of Oita Prefecture. Various kinds of geophysical, geochemical and geological surveys have been conducted at the fumarolic field for more than twenty years. Several hydrothermal system models were constructed based on the data obtained until the respective stages. The models are summarized as follows;

1)Steady state heat and mass balance model: The model was constructed by the observed heat and water discharge rates and the standard idea of hydrothermal system. The outline of the thermal state was understood by this model.

2)Steady state fluid flow model considering the cylindrical underground structure:The model was constructed by the observed heat and water discharge rates, the underground structure and the numerical simulator. The detailed thermal state and the direction of fluid flow were clarified.

3)Steady fluid flow model considering the 3D structure(before the 1995 phreatic eruption):The model was constructed by all the observed data so far and the numerical simulator which treats the 3D heat and water flow. It was clarified that the topography affected very much the pattern of fluid flow.

4)Transient fluid flow model considering the 3D structure(after the 1995 phreatic eruption):The model was constructed considering the changes in geophysical and geochemical data accompanying with the 1995 phreatic eruption.

Through the above evolution of the hydrothermal system model in the central part of Kuju volcano, we realized that the most important parameters in order to construct the hydrothermal system model are heat and water discharge rates, permeability structure and surface topography.