

Toward development of an eruption simulator

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Our project of 'Dynamics of Volcanic Explosion', which is supported through Grants-in-Aid for Scientific Research by Ministry of Education, Culture, Sports, Science and Technology, is proposing to develop an 'eruption simulator' as one of the research outcomes. Here the eruption simulator means a system that will be constructed in computers and used to evaluate possibility of volcanic eruptions with natures and disasters associated with the eruptions.

It is a simple idea that the eruption simulator indicates a computer program to calculate time-dependent processes involving some volcanic eruptions and other phenomena induced by them. Such computer programs surely constitute an important part of the eruption simulator. On the present level of volcanology, however, some physical mechanisms, such as those of degassing from magma, are understood only poorly even if their quantitative formulation may be essential for good description of eruptive processes. Furthermore the initial and boundary conditions necessary to the simulation can be rarely constrained satisfactorily from observations. For this reason, it is not straightforward to construct a practically useful computer program nor to derive some reliable inference from the calculation.

We should thus examine carefully what we can do in the present stage and how we should design a desired eruption simulator that will be practically useful for disaster mitigation. One of the possible ways we can take would be to use our knowledge about eruptions more widely including some empirical relations and to allow a more flexible use of the simulator. Along this line, I would like to propose as an eruption simulator the system that has the following four functions. 1) To provide some basic data that is usable to prescribe various parameters for the simulation. 2) To analyze observational data so as to constrain the initial and boundary conditions of the simulation as tightly as possible. 3) To apply some general principles to individual cases for a rough estimate. 4) To calculate time-dependent eruptive processes in detail using as much related information as possible. I expect that combination of these functions will significantly enhance applicability of the system to various problems in various ways.