

VHub – Cyberinfrastructure for volcano eruption and hazards modeling and simulation

Greg A. Valentine

*Center for GeoHazards Studies, University at Buffalo, Buffalo, New York, USA
(gav4@buffalo.edu)*

Tens of millions of people around the world are at risk from volcanic eruptions. The risk is increasing as populations grow in active volcanic regions, and as national economies become increasingly intertwined. In addition to their significance to risk, volcanic eruption processes form a class of multiphase fluid dynamics with rich physics on many length and time scales. Risk significance, physics complexity, and the coupling of models to complex dynamic spatial datasets all demand the development of advanced computational techniques and interdisciplinary approaches to understand and forecast eruption dynamics. Innovative cyberinfrastructure is needed to enable global collaboration and novel scientific creativity, while simultaneously enabling computational thinking in real-world risk mitigation decisions – an environment where quality control, documentation, and traceability are key factors. This is a problem that is global in scale and cuts across resource levels and can, realistically, *only* be solved with development of a robust cyberinfrastructure. Supported by NSF, we are developing a virtual organization, referred to as VHub, to address this need. Overarching goals of the VHub project are: **Dissemination.** Make advanced modeling and simulation capabilities and key data sets readily available to researchers, students, and practitioners around the world. **Collaboration.** Provide a mechanism for participants not only to be users but also co-developers of modeling capabilities, and contributors of experimental and observational data sets for use in modeling and simulation, in a collaborative environment that reaches far beyond local work groups. **Comparison.** Facilitate comparison between different models in order to provide the practitioners with guidance for choosing the "right" model, depending upon the intended use, and provide a platform for multi-model analysis of specific problems and incorporation into probabilistic assessments. **Application.** Greatly accelerate access and application of a wide range of modeling tools and related data sets to agencies around the world that are charged with hazard planning, mitigation, and response. **Education.** Provide resources that will promote the training of the next generation of volcanologists and hazards specialists such that modeling and simulation form part of a tripartite foundation of approaches, alongside observational data and experimentation. **Adaptation.** Conduct ongoing, rigorous self-assessment to study the impact of the virtual organization and promote continual adaptation to optimize its impact, as well as to understand emergent collective learning and collaborative patterns.

For information see: <http://geohazards.buffalo.edu/VHub/>