Visualizing Simulated Volcanic Eruptions

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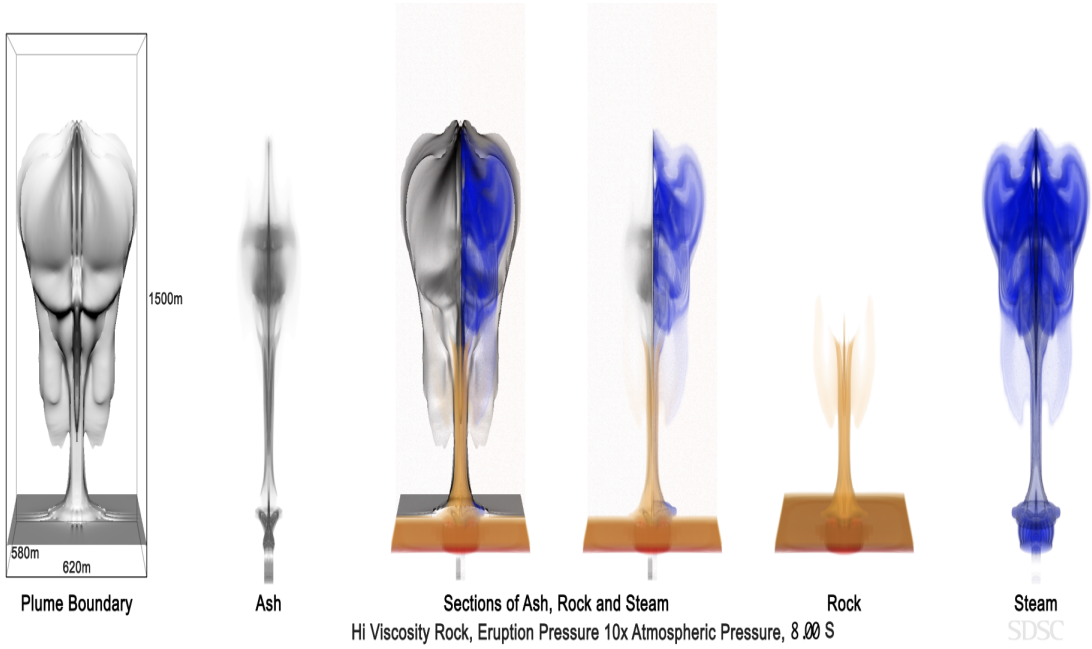
Abstract - Eruptive conduits feeding volcanic jets and plumes are connected to the atmosphere through volcanic vents that, depending on their size and 3D shape, can alter the dynamics and structure of these eruptions. The host rock comprising the vent, in turn, can collapse, fracture, and erode in response to the eruptive flow field. This project uses cutting edge visualization to illustrate and analyze results from fully coupled numerical simulations of high speed, multiphase volcanic mixtures erupting through erodible, visco-plastic host rocks.

The visualizations explore the influence of different host rock rheologies and eruptive conditions on the development of simulated volcanic jets.

Movie Link: (190 mb)
http://visservices.sdsc.edu/projects/volcano/movies/volcanic_eruption.mov



The image shows major components of volcanic eruption based on a simulation with initial conditions of Hi Viscosity and Eruption Pressure at 10 times atmospheric pressure at six seconds. The left inset shows Plume Boundary - a virtual boundary that encompasses all eruptive material inside it; second inset from left shows volumetric rendering of Ash; right most inset shows volume rendering of Steam; second inset from right shows volume rendering of Rock fragments. The center two insets show the combination of steam and ash in the rear two quadrants and rock in the front two quadrants with and without plume boundary in the back. This visualization enable us to understand the volumetric distribution of ash, rock and steam in isolation as well as in each other's context for a volcanic eruption.