Geophysical Research Abstracts
Vol. 13, EGU2011-6985-3, 2011
EGU General Assembly 2011

High speed imaging of geysers as an analogue to Strombolian eruptions

Elisabetta Del Bello (1), Jacopo Taddeucci (1), Piergiorgio Scarlato (1), Daniele Andronico (2), Corrado Cimarelli (3), and Carmela Freda (1)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Seismology and Tectonophysics, Italy (elisabetta.delbello@ingv.it), (2) Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Catania, Catania, Italy, (3) Earth and Environment, LMU – University of Munich, Munich, Germany

Geyser eruptions are characterized by the outbreak of a mixture of steam and water up to tens of meters above surface level. Such type of transient eruptive phenomena can be used as analogues for slug-driven Strombolian-type eruptions, though the source mechanisms governing the two types of eruptions are different. Observations on geyser activity may provide constraints on two-phase flow processes occurring in the shallowest portion of a volcanic conduit and on explosion dynamics. We present novel measurements on the transient motion of a large spherical-cap bubble and liquid displacement at the top of an almost cylindrical conduit. A series of geyser eruptions at Strokkur hot spring, in the well known Geysir geothermal area (Iceland) have been studied by using two high-speed cameras synchronized with a microphone. As observed during Strombolian eruptions, geysers show intermittent overflow prior to eruption, and an eruption that may consists of multiple thrusts/pulses. The displacements of the spherical-cap bubble and the annular liquid sheet were determined from synchronous high-speed video images captured at 1000 fps, with a 600x800 pixel resolution for a 50 mm lens, and a 500x370 pixel resolution for a 135 mm lens, respectively. From these measurements velocities and accelerations of the jets were calculated. The height of water jets and deviation from vertical due to wind direction were measured using synchronized videos of the eruptions filmed with high resolution digital camcorder at 300 fps and a 500x380 pixel resolution. An infrasonic signal was acquired for each transient event using a custom-designed microphone. Obtained acoustic signal exhibits waveform and amplitude similar to that observed at many basaltic volcanoes. Our study allowed a detailed parameterization of a range of dynamic processes for geyser explosions, and provided useful information on real-scale eruptive processes that can be directly applied to volcanic explosive phenomena.