INVESTIGATING DEGASSING MECHANISMS AT PACAYA VOLCANO, GUATEMALA WITH CONCURRENT UV CAMERA GAS MEASUREMENTS AND SEISMO-ACOUSTIC RECORDS

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Pacaya volcano exhibits the simultaneous occurrence of effusive volcanism and explosive strombolian events. Strombolian explosions are attributed to the bursting of gas bubbles at the magma free surface, and should therefore be represented in the gas emission record. However, the constant fuming at Pacaya indicates a less intermittent mechanism, such as rapidly convecting magma, is responsible for the behavior of the plume. In order to investigate which degassing mechanisms are responsible for variations in the gas emission rate at Pacaya a field campaign was conducted January 7 – 9 of 2008. The major datasets collected were sulfur dioxide (SO₂) emission rate, seismicity and infrasound. SO₂ emission rates were collected with a UV camera from 3.6 km west and 3 km southwest of the summit crater, with an average sample rate of 0.5 Hz. Five 3-component seismic stations were temporarily installed between 0.6 and 3.1 km from the summit; three stations were also equipped with microphones.

UV camera-derived SO₂ emission rates during the field campaign varied from 0.6 to 14 kg/s, with rapid changes in emission rate (4 to 7 kg/s in a couple of minutes) repeatedly observed. The dominant event types recorded with the seismoacoustic array were small summit explosions characterized by simple “N”-wave acoustic signals. During a three-hour period, 115 explosions were recorded in the acoustic record. Events were not regularly spaced in time, but we found the total number of explosions of a given size was inversely related to the event amplitudes. Below 0.5 Pa (at a distance of 1 km), this relationship was nonlinear suggesting that the number of small explosions is undersampled. Peaks in gas emission rate did not correlate well with occurrence of acoustically-recorded explosion events or acoustic event amplitude, suggesting that emissions from other “passive” processes overwhelmed the explosive emissions. In fact, preliminary analysis of nonharmonic seismic tremor suggests that there is a relationship between increased gas emission and a cessation of seismic tremor. The ratios of radial to vertical amplitude indicate a correlation between peaks in gas flux and variation in source process location suggesting a shallowing of the tremor source during periods of increased degassing.