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Explosive activity of the Tungurahua volcano, Ecuador, inferred from acoustic and seismic waveforms analyses the temporal evolution of the source

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Tungurahua volcano, located in the Ecuadorian Andes, renewed its activity with both Strombolian and Vulcanian eruptions in 1999 and remained active until 2016. We studied acoustic and seismic data recorded during the intense eruptions of July-August 2006, that include August 16th 2006 subplinian paroxysm. This episode may be divided into 3 periods: period I from July 14th to 27th, period II from July 28th to August 15th, period III from August 16th to 17th. Calculating the acoustic power based on the monopole source model, we estimated the mean gas velocity as 35, 10 and 40 m/s in period I, II and III, respectively. The total volume and gas volume flux are estimated respectively at 1.2 x 10^7 m^3 and 11 m^3/s for period I, at 4 x 10^6 m^3 and 2 m^3/s for period II, 2 x 10^7 m^3 and 226 m^3/s for period III. The inactive period of 11 months, before period I, prior to a Strombolian phase, gradually developing into a Vulcanian-Subplinian phase on July 14th and August 16th, can be interpreted as the time required to restore a foam layer in a magma reservoir. This layer remained stable until it coalesced at a certain height, generating both small Vulcanian columns and Strombolian eruptions. The vulcanian columns are generated by the accumulation of small bubbles forming foam on top of the column of magma that forms a degassed plug in the upper conduit. Their thicknesses vary between 15 m and 1.2 km. The Strombolian explosions are generated by foam that coalesces slowly from the reservoir, generating huge gas slugs. This degassing phase alternated explosions at regular intervals and characteristics gasping, hardly allowing the formation of a crust thicker than 30 cm, leaving the system open.