Precursors and Seismic Sequence of 1999 Guagua Pichincha Volcano, Ecuador

Yasuaki Sudo[1], Takeshi Hashimoto[2], Mario Ruiz-Romero[3], Hugo Yepes[3], Darwin Villagomez[3], Diego Viracucha[3]

[1] Aso Volcanol. Lab.,Kyoto Univ, [2] Inst. Geothem. Sci.., Kyoto Univ., [3] Instituto Geofisico, Quito-Ecuador

In June 1998 begun a very energetic swarm of tectonic events in Guagua Pichincha Volcano near Quito. Between July 24 and October 31, the swarm showed an average of 1200 events per month. A strong phreatic activity started in August 7, 1998. This activity was characterized by the occurrence of 19 phreatic explosions per month and a high number of seismic events. A monthly average of seismic events reached 1160 events. Since September 22, very energetic swarms of long period events precede the eruptions with magmatic origin. Until December 17, nine eruptions were detected. They allowed the formation of eight domes in the western edge of the caldera and their further destruction. The eruptions provoked five important ash falls in Quito city, the capital of Ecuador.

The 18 years-long period phreatic activity and the occurrence of swarms of tectonic events have characterized the precursory activity of Guagua Pichincha volcano. We present a brief description of this activity in order to discuss its significance for comparison with other volcano's precursors. The first renewal signal on Guagua Pichincha was noticed in 1981 with the appearance of a new fumarolic field and the occurrence of phreatic explosions. Since 1981 up to 1997 the activity remained with few phreatic explosions per year especially during rainy seasons. Meanwhile in August 1988 a swarm of 200 events per month occurred below the southern flank at 8-10 km depth. Besides, since June 1989 an increase of seismicity of Quito fault was showed. In August 1990, a 5.1 Ms earthquake caused important damage in Pomasqui town, 20 km far from the crater. In June 1998 begun a very energetic swarm of tectonic events in the northern segment of Quito fault. Between July 24 and October 31, the swarm showed an average of 1200 events per month, a few of them with a magnitude larger than 4.0. A strong phreatic activity started in August 7, 1998 in the dry season. This activity was characterized by the occurrence of 19 phreatic explosions per month and a high number of seismic events. Phreatic activity showed three main phases, one from August to November 1998, the second one from December 1998 to April 1999 and the last one from July to September 1999. A monthly average of seismic events reached 1160 events. Upon their waveforms and spectral contents, the seismic events were classified in volcano-tectonic, long period, medium period and hybrid and explosion events. Since September 22, very energetic swarms of long period events precede the eruptions with magmatic origin. Until December 17, nine eruptions were detected. They allowed the formation of eight domes in the western edge of the caldera and their further destruction. The eruptions provoked five important ash falls in Quito city, the capital of Ecuador.