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Model of the volcano-hydrothermal system of Tatun Volcano Group, northern Taiwan, inferred from seismicity and gas geochemistry

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The Tatun Volcano Group (TVG) is located in northern Taiwan near the capital Taipei. In this study we selected and analyzed almost four years (2004 - 2007) of its seismic activity. The seismic network established around TVG initially consisted of eight three component seismic stations with this number increasing to twelve by 2007. Local seismicity mainly involved High Frequency (HF) earthquakes occurring as isolated events or as spasmodic bursts. Mixed and Low Frequency (LF) events were observed during the same period but more rarely. During the analysis we estimated the magnitudes for the HF earthquakes and used a probabilistic non-linear method to locate all these events. We examined the temporal and spatial distribution of our data-set for each year and the monthly seismic energy distribution. In addition, complex frequencies for LF events were analyzed with the Sompi method. We juxtapose these results with gas geochemistry studies of fumaroles covering a similar period. A model for the volcano-hydrothermal system is proposed where fluids and magmatic gases ascend from a magma body that lies at around 7- 8 km depth. The movement of fluids to shallow depths increases the heat, the fracturing and also creates resonance and vibrations in cracks and conduits. This detailed analysis and previous physical volcanology observations at TVG suggest that the region is volcanically active and that measures to mitigate the risks have to be considered by the local authorities.