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Seismic hybrid swarm precursory to a major lava dome collapse: 9-12 July 2003, Soufriere Hills Volcano, Montserrat

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A swarm of about 9500 hybrid earthquakes preceded the 12-13 July 2003 dome collapse at Soufriere Hills Volcano, Montserrat. Most events had nearly identical waveforms and cross-correlation was applied to measure inter-event periods as well as phase arrival times to determine accurate relative location. Hypocenter depths were shallow (<3km), and relative locations were confined to a radius of <150m. This small source volume is consistent with the observed waveform similarity. Changes in inter-event periods and energy release, measured from the seismic records, showed that the volcano evolved through several energetic states, possibly linked to cyclic magma movement. Shorter inter-event periods were linked to higher energy release rates and possibly reflect increased pressurization during periods of low extrusion rates.