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## Magma system pressurisation and long-term surface deformation at Soufrière Hills Volcano, Montserrat

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Soufrière Hills Volcano (SHV) is an andesitic dome-building volcano on the island of Montserrat (British West Indies). SHV began its current, and anomalously long, eruption in 1995, but eruptive activity has been intermittent with phases of lava extrusion separated by periods of relative quiescence. The current pause in eruption started in February 2010 and is the longest yet recorded, 10 years and 11 months at the time of writing (January 2021). Continuous GPS measurements show island-wide inflation from 2010 onwards, with the rate of inflation slowly decreasing with time. However, the length of the eruptive pause raises questions as to whether there have been significant changes to the magmatic system and/or the eruption at SHV might have ended. To assess the behaviour and evolution of the SHV magmatic system since 2010 and the relation to ongoing hazard assessment, we analyse the continuous GPS temporal deformation trends using a suite of geodetic numerical models. Our models incorporate a temperature-dependent viscoelastic rheology, topography derived from a Digital Elevation Model and three-dimensional variations in mechanical properties derived from seismic tomography. The models are driven using one of four possible time-dependent source functions, to simulate differences in the temporal evolution of the magmatic system. The results show that the observed deformation data requires a temporal source function whereby the magmatic system pressure is increasing with time. A viscoelastic crustal response cannot explain the long-term deformation trends alone. The nature of the source pressurisation is unclear, and could be due, for example, to one or a combination of, magma supply, degassing/volatile influx, or overturning within a transcrustal magmatic system. Continued pressurisation within the magmatic system highlights the need for sustained vigilance in the monitoring and management of the volcano and its surroundings.