

# **GPS GEODETIC MEASUREMENTS OF VOLCANOGENICALLY INDUCED SURFACE DEFORMATION ON DOMINICA, LESSER ANTILLES**

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Dominica, a Caribbean island located between the islands of Martinique and Guadeloupe along the Lesser Antilles island arc, contains 4 to 8 potentially active volcanic centers and has been experiencing significant episodes of seismic swarms in the last 5 years. We used GPS geodesy to measure the magnitude and direction of deformation on several strategically selected points on the island.

Absolute point positions were obtained in 2001 using GPS. In June of 2003, new data were collected on each of the nine previous points, and three additional benchmarks were also installed. Ashtech Z-12 dual frequency, code-phase GPS receivers, Ashtech Dorn-Margolin choke ring antennae, and three different mounting systems depending on the site configuration were used in 2003 to collect three days of continuous data to determine an independent precise position for each UTC day at that site. The raw observation data from the Ashtech receivers were downloaded onto laptops in the field and then converted into RINEX using TEQC. The data were processed using final precise orbits and clocks from JPL using the GIPSY-OASISII (rel. 6) software environment. Data were processed to yield absolute point positions and transformed into ITRF 2000 using JPL xfiles. Velocity vectors were resolved for each of the nine original points measured in 2001. The background Caribbean plate velocity at each point was removed.

Once the GPS data were processed, many sites showed local deformation at a level of several millimeters per year, although uncertainties still remain large. In the southern part of Dominica, a set of two vectors point toward each other and toward the largest concentration of shallow earthquake epicenters. A similar geometry is observed for the GPS-derived velocity vectors in northern Dominica, where two vectors point toward the main cluster of the shallow epicenters from the most recent seismic swarm. These local deformation measurements, when coupled with the recent shallow seismicity observed on the island, may indicate a possible shallow magma source as the cause of the earthquakes in the north and the south. Quantitative deformation modeling and additional GPS observations, however, must be done before any unequivocal conclusions can be reached.