ABSTRACT

THE COMPUTATION OF THE TECTONIC DISPLACEMENT FIELD IN TRINIDAD DURING THE TWENTIETH CENTURY

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The 1901-1903 triangulation network of Trinidad, which includes over 22,000 observations connecting over 600 stations was re-adjusted on the Naparima 1955 and WGS84 datums. The adjusted coordinates are then compared with the Directorate of Overseas Surveys (DOS) coordinates of 1963 to give the displacements of 96 common points over the period 1901-1963. Similarly, the displacements of 25 common points during the period 1901-1994 are computed by comparing the adjusted 1901-1903 coordinates to the GPS network of 1994-1996.

The 1901-1963 and 1901-1996 estimated displacements show similar trends although the latter are more than twice as precise as the former. They both show that Trinidad is divided into two (almost rigid) blocks separated by a right lateral transform fault extending through the Central Range, not along the Northern Range (El Pilar Fault System) as was previously believed. The magnitude of the relative velocity deduced from the readjusted 1901-1903 coordinates and the 1994-1996 GPS coordinates is (11.0$\pm$0.9)mm/year. In comparison, the readjusted 1901-1903 coordinates and the 1963-1965 Naparima coordinates gives a velocity of (13.1$\pm$3.0)mm/year, assuming linear, steady motion.

Two models were fitted to the 1901-1994 displacements and statistically tested in an attempt to classify the Central Range (CR) fault system. The test results best support the occurrence of a creeping right lateral transform fault along the Central Range, but a locked fault model cannot be conclusively rejected and its chi-square statistic is only slightly (possibly insignificantly) worse than that of a creeping fault. A creeping fault along the CR is good news for Trinidad since it implies very little seismic hazard. Further densification and monitoring of GPS networks across the Central Range is necessary to refine these findings.

Keywords: Shivanti Balkaransingh; Trinidad; plate tectonics; displacement field; non-linear (robust) free network adjustment