THE 1995 MACAS EARTHQUAKE SEQUENCE, ECUADOR: BRITTLE FAILURE OF A FLOWER STRUCTURE

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At 01:51:24 on 3 October, 1995, an M_s = 7.0 earthquake struck near Macas, Ecuador, and was followed by a M_s = 6.1 shock 12 hours later. Six moderate aftershocks $m_b > 4.9$ occurred within a month of the main shocks, and during 100 days following the mainshock, more than 2000 aftershocks $M_l > 3$ were recorded by the Ecuadorian seismic network.

The objective of this research was to study the eight largest shocks of the Macas earthquake sequence using body waveforms. In a broad sense, my work is part of the long-range Geoscience effort to improve our understanding of earthquake processes and earthquake hazard assessment in regions of active tectonics. More specific goals included obtaining good estimates of the depth and faulting geometry of the events by inverting their body waveforms with a suitable velocity model for this area.

This earthquake sequence occurred in the Cutucu Uplift, in the Sub-Andes of Ecuador. The Cutucu Uplift is located on top of a flower structure, which is composed of a main fault that splays toward the surface in different strands. Results from this study show that the eight largest aftershocks occurred at depths above 30 km, which is consistent with the geology. The main shock ruptured the main fault strand of the flower structure; the largest aftershock apparently ruptured two smaller faults at the same time, based on its large non double-couple component of the moment tensor. The mechanisms for the eight largest shocks indicate a mostly E-W compression, which is perpendicular to the Andes in the area, and is consistent with the direction of shortening that takes place in this mountain belt.