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Earthquake Budgets for the Middle America Trench: Chaos and the Last 40 Years

Spatio-temporal and magnitude earthquake patterns derived from the Middle America Trench reveal aspects of basin formation and stress distribution. A detailed review of earthquake data, principally from the early 1960's to the present, for the Middle American Tectonic Zone identifies distinct spatio-temporal zones and repeated seismic activity and overall secular trends of frequency and magnitude over the past forty years. The number of seismographs has increased appreciably after 1990, changing the total number of earthquakes recorded and their attribute data. Plots of earthquake event frequency over decadal, annual, and monthly time-periods reveal distinctive patterns.

Analytical techniques applied to chaotic systems reveal additional patterns of seismicity. Point-cloud graphs of hypocenter depth versus magnitude versus time and analysis of spatio-temporal dynamics suggest that zones of activity are highly migratory on short time scales, <1 month. Significant clusters of activity are only likely to form on time scales of at least several months to years. Furthermore, clusters of activity may become inactive for months to years and then reactivated. Therefore, budgets describing recurring short-term patterns of seismicity may be a feasable means of characterizing future zones of seismic activity several months to years ahead.