SEISMICITY AND SEISMOTECTONICS OF THE VERDE VALLEY AND TRANSITION ZONE OF CENTRAL ARIZONA

by

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A Thesis

Submitted in Partial Fulfillment

of the Requirements for the Degree of

Master of Science in Geology

Northern Arizona University

May 1990

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ABSTRACT

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A 46 day microearthquake study during the Spring of 1987 recorded 13 local earthquakes in the Verde Valley of Central Arizona. Data synthesized from studies at this southern end of the Northern Arizona Seismic Belt (NASB) support a microearthquake activity rate of .22 to .30 events/day for the Chino and Verde Valley area. Clustered along the neotectonic northern segment of the Verde Fault system, ninety percent of the microearthquakes recorded in the Verde Valley occurred in the upper 10 km of crust.

Compared to the northern NASB, this part of the physiographic Transition Zone (TZ) exhibits relatively larger background microseismicity in the range $.70 \leq M_D \leq 1.4$. Approximately 70 percent of the microseismicity in the northern NASB consists of ultra-microseismicity ($-1.0 \leq M_D \leq .70$). Precluding detection threshold of the seismic instrumentation as a cause, the absence of ultra-microseismicity in the TZ may be related to crustal rheology, joint density, or attenuation characteristics of the crust. The frequency of moderate-sized microearthquakes in the northern NASB and southern NASB, specifically those with magnitudes represented through $.70 \leq M_D \leq 1.4$ and $1.9 \leq M_D \leq 2.3$, appear to be comparable. The larger of these two magnitude ranges

measures .05 events/day in the Kaibab Plateau and Verde Valley area, whereas the smaller magnitude range is scaled between .40 and .22 events/day, respectively. A cumulative analysis of microearthquake activity rates and magnitudes from central and northwest Arizona suggest that the northern and southern NASB may, within an order of magnitude, relieve equivalent, constant levels of crustal strain through background microseismicity.

The study finds that a steep Bouguer anomaly gravity gradient following the NASB becomes obscure in the Verde Valley area, suggesting that the decrease in recurrence of larger magnitude earthquakes ($M_D \geq 3.0$) may be associated with the termination of the cause of the anomaly. The lack of ultra-microseismicity and the lower level of large magnitude earthquake activity may signal the initiation of a separate seismotectonic domain, one related solely to deviatoric stresses induced from isostatic disequilibrium along the southern boundary of the Colorado Plateau.

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