

## Spatial analysis of seismogenic zones in the mid-continental and eastern parts of the NAP with respect to the multi-ring impact structure hypothesis

Records of historical earthquake seismicity in the region were obtained from WWW portals maintained by the U.S. Geological Survey (USGS, the Boston College Weston Observatory, the New Jersey Geological Survey, the Ohio Geological Survey, and the Indiana Geological Surveys. The records of historical earthquakes include both instrumental and noninstrumental earthquake locations and magnitudes. Noninstrumental events stem from a variety of historical accounts including newspaper articles, scientific publications, government reports and records. Non-instrumental epicenter locations are significantly less accurate in comparison to instrumental epicenter locations. Catalog information for instrumental events vary from somewhat to highly accurate depending on the instruments and instrument spread used to identify the epicenters.

A computer-based search for earthquake events from the USGS National Earthquake Information Center (NEIC) on January 20, 2005 returned a list of 266,862 earthquake events for the period of 1973 to 2001 in the region between 90N to 90S latitudes and 30E to 150W longitudes. The Weston Observatory data include three different catalogs for events recorded before 1990, from 1990 to 1999 and from 2000 to 2005. Those data having geographic coordinates includes 3602 events occurring between latitudes 39N to 60N and longitudes 46W to 83W. The New Jersey earthquake catalog includes 320 events through 1990 between latitudes 38N to 42N and longitudes 72W to 76W. The Ohio catalog includes 179 events recorded from 1776 to 2004 between latitudes 38N to 42N and longitudes 80W to 85W. The Indiana catalog includes 59 events recorded from 1827 to 2002 between latitudes 38N to 42N and 72W to 77W. Many events recorded in the Weston Observatory and State catalogs are included in the USGS catalog. Earthquake events greater than or equal to magnitude 2 having geographic coordinates in the NEIC, Weston, Ohio and Indiana catalogs were combined into a single database list and parsed to eliminate duplicate records. A GIS point theme was produced from the combined results using the Environmental Systems Research Institute, Inc. (ESRI) shapefile format. The resulting coverage has 28,139 events. Of this total 26,625 include depth values and 27,852 are greater than or equal to magnitude 2.0.

Seismic zones were mapped from the NEIC records using the ArcView GRID program. Densities of earthquake epicenters (events/sq. km) were calculated using a 1-degree cell size and a search radius of 50 km, then displayed using a range of density values as shown in figures F9, F10, and F11.

A spatial analysis of historical earthquake seismicity versus distance and depth is shown to the right relative to the Chicxulub impact point. Depths of historical earthquakes versus distance from impact were plotted along four quadrants to investigate spatial relationship between upper mantle and crustal seismicity with respect to the proposed multi-ring architecture of the Chicxulub impact

