

**Investigation of integrated geologic and geophysical data using GIS:  
Crooked Creek and Decaturville impact structures, Missouri**

G.A.J. Nickerson<sup>1</sup>, J.G. Spray<sup>1</sup>, and L.A. Mayer<sup>2</sup>

*<sup>1</sup>Impact Geology Group, Department of Geology, University of New Brunswick,  
2 Bailey Drive, Fredericton, New Brunswick E3B 5A3, Canada*

*<sup>2</sup>Department of Geodesy and Geomatics, University of New Brunswick,  
Fredericton, New Brunswick E3B 5A3, Canada*

The morphometry and geology of structures formed by the impact of extraterrestrial objects with the earth are systematic by nature. The processes involved in the formation of impact structures however are not completely understood.

The general morphometry of impact structures is known from observations of the moon, other planets and the detonation of explosives. Modification of impact structures by erosion often makes identification of structural features difficult and adds ambiguity to the geologic record at the earth's surface. Thorough investigation of highly eroded structures may require supplemental information via drilling and geophysics.

An investigation of the Crooked Creek and Decaturville impact structures of Missouri, U.S.A., was conducted using three-dimensional interactive visualization technology. Topographic data and drill core logs were obtained from government sources. Geophysical data from the Crooked Creek structure was also obtained. The data was digitized for use with GIS. Topographic and geophysical data were gridded to form three-dimensional surfaces. Drill core data was converted into two-dimensional vectors. GIS software was used to integrate the data in a geospatial reference system.

The data was investigated in three dimensions using UNB's Fledermaus software. Fledermaus can integrate and display both raster and vector data in three dimensions. Fledermaus offers several data manipulation tools, to enhance viewing of subtle topographic and subsurface features, as well as geophysical data. Fledermaus provides tools to measure and export profiles of continuous surfaces for construction of geologic cross sections. Fledermaus facilitates the output of cartographic media in soft copy, hard copy maps or animations.

The ability to visualize and interact with spatial data allows the user to inspect data in three dimensions and to move about the data in real time. The integration of several data sets allows for the construction of a multidimensional model. The manipulation of digital data also makes it possible to reconstruct the morphometry of the impact structure as it may have appeared at the time of impact.