Geo-Scenes

Editor's Note: *This new section of the bulletin will periodically feature scenes of geological interest in Kansas and from anywhere else in the world, or for that matter, on other planets in our solar system. All readers are encouraged to submit such images along with short, explanatory captions as illustrated below. Send all submissions via electronic format (images as jpegs, and separately, text in Microsoft Word or WordPerfect format) to the technical editor, Sal Mazzullo, at either salvatore.mazzullo@wichita.edu or dolomite@cox.net.*

Surficial Karst Features (Landforms) along Unconformities on Carbonate Rocks

Several of the most prolific hydrocarbon reservoirs in Kansas are found beneath major unconformities along the tops of the Arbuckle, Viola, Hunton, and Mississippian. Such reservoirs (subunconformity types) variously are present in porous and permeable limestone, dolomite, chert, and in some cases spiculite. Geologists typically map the tops of these units as structural features, knowing full well that they actually represent structurally modified paleogeographic (paleotopographic) surfaces whose paleogeomorphologic development was related mainly to processes included under the broad umbrella of karstification. Such processes are dominated by meteoric (fresh-water) dissolution of carbonate rocks, and they result in relatively small-scale features such as sinkholes, dolines, and caves and caverns along regional paleotopographic surfaces. Such surfaces may include, on a larger scale, buried hills (including karst towers) of various elevation and dimension and intervening valleys or topographically lower areas between hills. The regional geomorphologic character of such paleotopographic surfaces varies greatly, and it reflects differences in rock porosity and permeability, presence or absence of fractures (and faults), structural attitude of subcropping strata, climate, bedding thickness and specific lithology of the rocks, and other factors. Notwithstanding faults, any exploration geologist who has mapped the tops of the Arbuckle, Viola, Hunton, or Mississippian is well aware of the differences in paleotopographic relief, related to karstification, along the unconformable tops of these units.

Figure 1 - Smooth karst surface with sinkholes (black arrows) and shallow dolines (white arrow) along the top-of-Pleistocene (138,000 years old) limestone on Ambergris Caye in Belize.

In many cases in science we see that small-scale characteristics of features often mimic larger-scale features, and this coincidence is especially true along unconformities. The two photographs herein (Figures 1 and 2) are examples of such coincidence. These photos are of the top of the Pleistocene limestone on Ambergris Caye in northern Belize. The limestone is radiometrically dated at 138,000 years old. The small-scale features along the unconformity surface here are similar to those found in the subsurface of Kansas in Arbuckle, Viola, Hunton, and Mississippian rocks. Figure 1, for example, shows a relatively smooth unconformity surface comprising low, rounded hills and intervening low areas. When these low areas are relatively shallow and flat, they are referred to as dolines. Such features can be of various areal dimensions, and they typically are manifested in the subsurface as low and relatively flat "structural" areas. Scattered across this low-relief geomorphic surface are small, rounded sinkholes that commonly connect to subsurface caves and caverns. This topography resembles, for example, that along the top of the Mississippian in central Kansas (e.g., Ness County) and eastern Kansas (e.g., Butler County). In these areas hydrocarbon production commonly is from relatively low, rounded buried hills of various dimension. Many of you undoubtedly