

## **Structural Characteristics of the Powder River Basin-Big Horn Uplift Margin**

Lisenbee, Alvis L.<sup>\*1</sup>; Garraffa, Alfred<sup>1</sup>; Sawyer, Foster<sup>1</sup>; Clift, Andrew<sup>1</sup>; Stevanovic-Walls, Ivana<sup>1</sup>; Jenkins, Creties<sup>2</sup>; Chasten, Lindsay<sup>1</sup> (1) Geology and Geological Engineering, South Dakota School of Mines and Technology, Rapid City, SD. (2) DeGolyer and MacNaughton, Dallas, TX.

The 190 km-wide Powder River Basin is a rotated crustal slab dipping one and one-half degrees westward from the Black Hills Uplift to the Big Horn Uplift. The axis of the resulting asymmetric basin lies within a few kilometers of the Big Horn Uplift margin or, locally, beneath thrusts there. A maximum of 5,450 meters of Cambrian through Tertiary strata, including thousands of meters of Paleogene, syntectonic clastic rocks, are present. Combined with the 2,600 meters of topographic expression of the Big Horn Range, total structural relief is greater than eight kilometers.

The eastern margin of the Big Horn Uplift is a complex of deep-seated thrust faults and monoclines divided into three compartments by transverse structures. The southern segment is dominated by west-vergent (i.e., out-of-basin) thrusts, dominantly seen at the current level of exposure as asymmetric anticlines; the central portion contains east-vergent thrusts (the footwalls of some of which comprise syn-tectonic conglomerate) and monoclines: the north segment contains a large monocline carried on a blind thrust. The range front is formed of Paleozoic strata or Precambrian basement, but the structural margin of the uplift lies within the topographic basin to the east in more easily erodible Mesozoic or Paleogene strata.

The present study updates M.S. thesis work which illustrated the structural boundary in cross sections and presented structure contour maps on the Pennsylvanian Tensleep Formation. Newly acquired drill records from the Wyoming Oil and Gas Commission have been integrated into these previous data sets, to prepare a more comprehensive GIS-data base. Wells penetrating the Tensleep/Minnelusa are added directly to the database with information, e.g., depth to formation, date drilled, latitude/longitude, surface elevation, production, etc., stored as attributes. For shallower wells, the projected depths to formations above the Tensleep/Minnelusa are interpreted by substituting thicknesses found in nearby wells. The results allow generation of structure contour and isopach maps for various stratigraphic levels in the basin which are younger than Pennsylvanian and give a better-constrained view of the geometry of the western basin margin and the known oil distribution there.