

Extension of New Tertiary Gravity Slide Plays from Montana into Southwestern Saskatchewan – Re-evaluation of a Potential Prolific Shallow Gas Play

Per Kent Pedersen*

Department of Geoscience, University of Calgary
pkpeders@ucalgary.ca

and

Karsten S. Nielsen

Vice President of Exploration, PetroGlobe Inc., Calgary

Recent activity in northernmost Montana and southwestern Saskatchewan has greatly expanded the area of shallow gas plays set up by Tertiary gravity slides of the Bearpaw Mountains. Gas production have in northern Montana historically primarily been associate with pop-up structures, with the main productive zone being deltaic sandstones of the Eagle Formation, which is time equivalent with the Milk River/Alderson strata in Saskatchewan. Recent drilling activity in northern Montana have expanded the play significantly by identifying new pop-up structures, but also by identifying gas charged high relative permeable Medicine Hat sandstones, a zone with little historic gas production in Montana. More interestingly, large extensive gas charged sandstones within the Eagle and Medicine Hat formations has been discovered trapped by the transform faults associate with the individual gravity slides blocks. The traditional shallow pop-up play concept was tested in southwestern Saskatchewan with limited successes in 2003. However, several of these new producing pools set up by the transform faults are just south of the Saskatchewan border, and the area should be re-evaluated for similar play opportunities on the Saskatchewan side. The Tiger Ridge (extensional faults) and especially the Battle Creek pools are potential analogs for similar plays in southwestern Saskatchewan, where Battle Creek has produced more than 65 BCF and Tiger Ridge close to 400 BCF.

The gravity slides were induced by basement tectonic and volcanic activity at Eocene time forming the Bearpaw Mountains in northern Montana. The associated doming formed slope angles on the flanks of the structure of a few degrees, which was enough to create gravity sliding up to 50 km away from the mountains with two Upper Cretaceous bentonite intervals acting as the main décollement surfaces. The extension of the gravity slides all the way into south-westernmost Saskatchewan can be identified by repeat sections of the Niobrara and Milk River formations in wells and by steeply dipping outcrops observed in river beds. The thrust structures in southwestern Saskatchewan has been crudely mapped by integrating well logs, outcrops and creekology, and integrated with structures delineated in northern Montana. A more precise delineation of the various structures could be done using seismic and gravity surveys.