Hydrocarbon Accumulations and Exploration Considerations Associated with Impact Structures

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High-velocity impacts of solid bodies on planetary surfaces trigger an explosion-like process resulting in characteristic circular structures called “impact craters or structures”. Approximately 180 impact structures have been recognized on Earth, representing about a quarter of the estimated preserved structures in the geological record. The impact events are an integral part of the earth geological history and some of them have presented significant economic opportunities.

The impact process can facilitate or hinder any critical element of a working hydrocarbon system depending on the geological circumstances. Drilling success rates in an impact setting are comparable to those in any other play. The recoverable hydrocarbon reserves in the following structures owe their origin in part to the impact process: Ames (53 mil. boe), Avak (9 mil. boe), Cloud Creek (3-30 mil. boe), Eagle Butte (8 mil. boe), Newporte (15 mil. boe), Red Wing (43-73 mil. boe), Steen River (0.3-1 mil. boe), collapse breccias of the Chicxulub structure (57 bil. boe) and possibly one accumulation at Tookoonooka (0.3 mil. boe). The same appears to be true for the accumulations at the probable impact structures Bee Bluff (0.3 mil boe), Calvin (3 mil boe) and Viewfield (12-14 mil. boe). Additionally, immature post-impact source rocks have been mined at Boltysh and Rotmistrovka, and also documented at Obolon, Flynn Creek and Ries structures.

Contrary to previous work, this study documents that: 1) the accumulations at the Marquez and Sierra Madera impact structures are not related to the impact process, 2) the heat generated during an impact event does not contribute to the maturation of the pre- or post-impact source rocks, and 3) there are no spatial or temporal trends in the distribution of impact structures that could be used to guide exploration for undiscovered structures. However, the probability of finding an impact structure of a particular size in a particular sedimentary basin can be calculated from the known cratering rates, the time span and the area of the basin. Deep ocean floor areas must be excluded because thick water column prevents formation of most impact structures. Aerially extensive data sets (i.e. seismic, potential fields and imagery) can also be used to scan for circular structures.

This study resulted in a public impact database published at http://impacts.rajmon.cz.