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Lake Bosumtwi Ghana, A Modern Analogue for an Impact Structure Hydrocarbon System

Over the past several decades meteorite impact structures have been recognized as possible hydrocarbon prospects, and several craters in North America are associated with hydrocarbon production. Under certain circumstances, impact structures may become self-contained hydrocarbon systems, with source and reservoir facies embedded within the impact feature. Terrestrial impact structures situated in favorable climates, and especially those in low latitudes, may develop biologically productive, stratified lakes that contain thick accumulations of organic-rich sediments and hydrocarbon source rocks. We present Lake Bosumtwi, Ghana, as a case study of a modern meromictic lake system within an impact structure, that could develop into a self-contained hydrocarbon system. We recently completed major seismic reflection and sediment coring campaigns in order to constrain the geological structure and climate history of the 10.5 km diameter lake. During this field work we acquired 24-fold basin-scale seismic data, single-channel high-resolution seismic data, and a suite of sediment samples across the basin. Subsurface images reveal a total sediment thickness of ~310 m in the 70 m-deep lake, and a pronounced central uplift of low-velocity breccia-melt material in the basin center. We combine subsurface geophysical data with a Digital Elevation Model of the surrounding crater structure, to develop a sediment mass balance model for the basin. With the morphologic model we make volumetric estimates of the maximum potential source rock section in the basin, and using values of organic richness in the modern sediments, we then estimate the total potential hydrocarbon yield in this enclosed sedimentary system.