Using Sonic and Seismic Indications of Coastal Plain Unconformities to Suggest Missing Sediments and Downdip Development of the Eastern Atlantic Coastal Plain and Shelf

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High resolution geological and geophysical investigations at the USDOE Savannah River Site utilized a series of deep boreholes plus deeper existing coastal plain wells to establish a series of regional cross-sections and basemaps. These cross-sections were made utilizing sophisticated wireline geophysical logs, core data, geotechnical direct push technology logs for shallow interrogation, and seismic data and were complimentary to the many regional cross-sections and large scale maps made by historical researchers. These sections and maps were then used in regional seismic hazard characterization and evaluation and for other environmental studies. Additionally, both regional and higher resolution localized seismic data added to the overall efforts. The dominant sediments evaluated were Late Eocene through Late Cretaceous from the Upper Atlantic Coastal Plain but sediments to possible Norian age were evaluated in the lower coastal plain and shelf.

During this work it became apparent that unconformities in both the Upper, Mid and Lower Atlantic Coastal Plain were strongly correlated to abrupt variations in sonic logs that translated from the deep to very shallow horizons. The major published regional unconformities as well as smaller sub-regional unconformities were apparently present in the data. Additionally, in the shallow horizons, geotechnical information was present that allowed for a calculation of estimated overburden or burial depth. This suggested that it might be possible to estimate the amount of sediment missing from an unconformable horizon. This was important in estimating the volume of sediment that moved downdip. Knowing the amount of missing sediment might aide in estimating uplift, subaerial exposure time, paleoclimate, burial depths and thermal history, and aide in the understanding of what geobodies might be present downdip. These may be important factors in evaluating the hydrocarbon potential of the lower submerged coastal plain and continental shelf.

For the Upper Atlantic Coastal Plain it is probable that more sediment is missing than remains. Shallow sediments, often defined in the literature as different aged or as a different formation are possibly re-worked and mobilized downdip. These sediments are essentially a localized regressive or transgressive expressions and have not moved downdip. Missing sediments, eroded and mobilized down slope become reservoir bodies or compartments. As expected the Lower Coastal Plain logs suggest that the sediment estimated from the Upper and Mid Coastal Plain to be missing is incorporated in the Lower Coastal Plain and the number of unconformities deceases. It then becomes possible to estimate the volume of sediment retained versus missing allowing for an estimate of available sediment for reservoir rock.