Upper Cretaceous Assessment for CO2 Storage in the Southeastern United States Offshore of Middle and South Atlantic

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ABSTRACT

With more than 80% of the world's energy being derived from fossil fuel, and considering that the U.S. Environmental Protection Agency estimates that about 40 percent of the anthropogenic CO2 emissions in the U.S. are generated in the southeastern United States, the lack of an offshore CO2 assessment constitutes a major gap in understanding the prospective regional storage resource. This is the first comprehensive assessment of the offshore CO2 storage resource capacity in the southeastern United States outer continental shelf. It focuses on the Upper Cretaceous geological unit only using legacy of Atlantic Margin industry 2-D seismic reflection (~160,000 km) and well data. In the study area, which is offshores of North Carolina, South Carolina, Georgia, and Florida, there is a thick sequence of post-rift stratigraphy ranging from Jurassic to Pleistocene age sediments. This research provides a consistent, integrated description, and reliable subsurface evaluation of the top and the bottom of the Upper Cretaceous section offshore of the South Georgia Embayment and predicts potential CO2 geologic storage capacity. For this area, structure maps were created and converted from time units to depth units using two approaches for generating velocity models. Also, structure thickness maps (isopach maps) were generated for the main potential reservoirs and seals. At a larger scale, offshore regional structure maps for the top and bottom of the Upper Cretaceous section were created for the southeastern Atlantic. The results indicate that the Upper Cretaceous units consist of moderately to highly compartmentalized stratigraphic systems. Five reservoirs and seals were recognized as potential storage units in the Upper Cretaceous section within the South Georgia Embayment. Two reservoirs are identified and considered as the main compartmental storage prospective for CO2 with quality and integrity capable to meet the CO2 storage requirements. They consist of limestones with significant interbedded sandstone, shales and dolomite, and sealed by thick sediments, mainly shale interbedded with limestone. There are distinct porosity and permeability regimes widely distributed, especially in the lower part of the Upper Cretaceous section. CO2 storage capacity is estimated to be 8.79 GT for the two significant reservoirs offshore of the South Georgia Embayment. However, as the Upper Cretaceous approaches towards the shoreline, the depth is not suitable for CO2 sequestration.