ASSESSMENT OF UPPER CRETACEOUS STRATA FOR OFFSHORE CO_2 STORAGE: SOUTHEASTERN UNITED STATES

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This is the first assessment of Upper Cretaceous strata for offshore CO_2 storage resources in the southeastern United States outer continental shelf. This research focuses on Upper Cretaceous geological units using legacy industry 2-D seismic reflection and well data. It provides an integrated description, and reliable subsurface evaluation of Upper Cretaceous potential storage reservoirs. In addition, provides a detailed evaluation on how rock porosities and permeabilities are distributed across the Upper Cretaceous strata restricted to the South Georgia Embayment (SGE). Structure and thickness (isochore) maps were generated for the main potential reservoirs and seals on a regional and local scale. Several seismic inversion techniques were tested and a new workflow of Model-Based inversion which gives an improved image to discriminate lithology and predict porosity were provided. This workflow can be applied to future CO_2 storage resource assessment studies elsewhere. The inversion results indicated that a distinct porosity and permeability regime are present and distributed in Upper Cretaceous within the SGE. The impedance and porosity relationships show a reliable correlation. This relationship reveals low impedance coincident to the high porosity intervals which are proposed as potential reservoir intervals for CO_2 storage. In addition, it shows that the Upper Cretaceous strata have mainly two potential reservoirs in the lower part. They are overlain by a thick impermeable interval, mostly shale, which has high impedance, low porosity, and low permeability, and extends within the SGE. Since porosity distribution is estimated using different methods, it follows the trends of seismic signature and structures of Upper Cretaceous strata. The extracted values of porosity (ranges from 15 to 36 %) and permeability (ranges from 1 to 100 mD) are close to the measured values from the well core data at the Upper Cretaceous strata interval. Five reservoirs and seals were recognized as potential storage units. Two reservoirs are particularly considered as the main CO_2 storage units with quality and integrity capable to meet the CO_2 storage requirements by the U.S. Department of Energy. They consist of limestone deposits with significant interbedded sandstones, shales and dolomites, and are sealed by thick shales interbedded with limestone. The porosity ranges from 20 to 30 % and the permeability ranges from 1 to 447 mD. Regional CO_2 storage capacity is estimated to be approximately 32 GT in Upper Cretaceous units. The local storage capacity for the two significant reservoirs in the southeast Georgia Embayment contribute ~ 9 GT of that amount.