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TITLE: Porosity and Permeability of Jurassic-Triassic Formations of the South Georgia Rift Basin: Potential Implications for CO2 Storage

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SESSION TITLE: GC44A. Carbon Sequestration: Geophysical Approaches to Characterization of Geologic Carbon Sequestration Reservoirs and Seals IV

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ABSTRACT BODY: Porosity and permeability are critical for evaluating reservoir injectivity and seal integrity for subsurface CO2 storage. Both properties are needed to determine the effective CO2 storage capacity. In addition, the ability to model and understand the physical interactions of the CO2 reservoir systems under in situ conditions is dependent on the reservoir porosity. We present results of rock physics evaluation of the porosity and permeability of the buried Jurassic-Triassic formations of the South Georgia Rift (SGR) basin using existing well and new experimental data. The SGR basin covers parts of South Carolina, Georgia, Alabama, and Florida and is buried beneath Cretaceous and younger Coastal Plain sediments. We focused our study on the South Carolina portion of the basin that has been identified in the Carbon Sequestration Atlas of United States and Canada as containing saline formations suitable for subsurface CO2 storage.

Results of our rock physics analysis confirm the presence of porous reservoir units capped by low-porosity diabase sills. These potential reservoirs appear to have the capacity (pore volume and porosity) to store significant quantities of supercritical CO2. Our analysis further suggests that the SGR basin may contain distinct porosity-permeability regimes (geo-hydrologic systems) that are influenced by depositional environments. These regimes are: (1) high-porosity, low/medium permeability, as observed in the Norris Lightsey well with Triassic formation porosity of 20 - 32.5 percent and core-derived permeability of 1.5 - 8.9 mD, and (2) low-porosity, low-permeability, based on the average total porosity of 6.3 percent and permeability of 6.6 (E-5) - 1.6 (E-2) mD reported in the literature for the Dunbarton Triassic sediments. The Norris Lightsey sedimentary rocks are primarily lacustrine deposits and consist of fine-grained Triassic sandstone with interbedded layers of siltstone and mudstone, while the Dunbarton basin is dominated by fluvial fine-to very fine-grained sandstone. We believe that our hypothesis of distinct geo-hydrologic systems for the SGR basin requires further evaluation. We will discuss the results of new experiments on selected Jurassic and Triassic core samples that are designed to better understand and quantify the distribution of porosity and permeability both locally and regionally.

KEYWORDS: [5114] PHYSICAL PROPERTIES OF ROCKS / Permeability and porosity.

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Additional Details

Previously Presented Material: