A Modeling Tool for Rapid Screening of Carbon Capture and Storage Sites: Investigations of Pressure

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Abstract

Carbon capture and storage (CCS) is gaining increasing attention as a key technology for the US to achieve carbon neutrality. The deployment of carbon capture and storage technologies at the required scale will require identification, development, and management of tens of thousands of CO2 injection wells in thousands of sites throughout the US. For the past several years, the SCO2TPRO software package has been under development to assist in rapid screening of the storage potential of reservoirs nationwide. The SCO2TPRO AI is trained on thousands of numerical simulations in a simplified domain to explore storage potential as related to reservoir porosity, permeability, thickness, depth, and temperature. Recent developments have included conversion of the underlying reservoir simulation software, construction of new reduced order models (ROMs), and the inclusion of basic forecasts of the radii of deviatoric pressure increases. Although the tool does not capture the full complexities involved in CCS projects, it provides an initial assessment of reservoir settings that merit further investigation. In this work, we focus on the pressure results. Deviatoric pressure increases typically extend far beyond the radius of the CO_2 plume and can have adverse effects (e.g., induced seismicity, well interference) over considerable distances from the injection site. Consequently, in cases where concerns exist about pressure increases in the injection reservoir, the number of injection wells may be reduced with resulting economic impacts on the development. In addition, the inclusion of pressure ROMs allows for quick screening of sites that may have increased hazards related to pressure. Sites may be excluded outright or mitigation measures might be taken which must be factored into management and investment decisions. Furthermore, pressure information can help guide investigations of risk factors such as fault slip potential or fracturing in the reservoir or seal. We provide examples of these applications and an analysis of pressure results.