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[PS]Carbon Dioxide Storage Capacity in the Upper Cambrian Basal Sandstone of the Midwest Region: A County-Based Analysis*

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Abstract

Porosity values collected from core analyses and geophysical logs from the Upper Cambrian Mount Simon Sandstone in the Midwest Regional Carbon Sequestration Partnership (MRCSP) region indicate a predictable decrease in porosity with depth that is best described by the relationship $\varphi(d, \text{in feet}) = 16.36 * e^{-0.00012*d}$ (r^2=0.41). This relationship and Mt. Simon's thickness were used to calculate net porosity feet, which was incorporated into the methodology presented in the Carbon Sequestration Atlas of the United States and Canada for estimating the potential storage capacity of CO_2 in deep saline aquifers. The variables that affect the volumetric calculations include: 1) the area that defines the region being assessed (county by county assessment in this study); 2) the mean porosity of the stratigraphic unit; 3) the gross thickness of the basal sandstone; and 4) the CO_2 storage efficiency factor, which accounts for material properties, including reservoir continuity and effective porosity. We conducted a sensitivity analysis to create two scenarios for CO_2 storage capacity, including efficiency factors of 0.01 and 0.04, respectively. To gain some insights into how applicable this methodology is, we compared the theoretical values of net porosity obtained from core analyses with those obtained from geophysical logs. This approach generated solutions for the spatial distribution of net porosity feet that facilitated the calculation of storage-volume potential for each county within the region. The total storage capacity for the region, calculated, using efficiency factors of 0.01 and 0.04, is estimated to be 37.8 and 151.2 billion metric tons of CO_2 respectively. This is approximately 74 percent higher than the values of 21.7 and 86.9 billion metric tons of CO_2 estimated by the MRCSP for the capacity of the Mount Simon Sandstone in the states of Indiana, Kentucky, Michigan, and Ohio.

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