

Integration of Wellbore and Geophysical Data for Evaluation of Sequestration Potential in Continental Flood Basalts: The Big Sky Wallula Basalt Pilot

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Mafic continental flood basalts globally form an important, but under-characterized target for the sequestration of anthropogenic CO₂. Deep basalt porous flow tops are potential sites for sequestration of gigatons of supercritical CO₂ in areas where the flow tops contain nonpotable water and are at depths greater than 800 m. Laboratory experiments demonstrate that chemically reactive Columbia River basalts have the potential to mineralize a substantial portion of injected CO₂.

Battelle and the DOE Big Sky Regional Sequestration Partnership are conducting a pilot test of the potential for sequestration in the Grande Ronde basalts at the Boise White Paper mill at Wallula, Washington. A 6.5 km multi-component seismic swath survey was conducted at Wallula in 2007, followed by drilling a 1250 m borehole in 2009. Injection of 1000 metric tons of supercritical CO₂ is scheduled for late January, 2011. The wellbore will be re-entered in 2012, cored and logged to determine rate of mineralization under field conditions. In this talk we review the project and the use of seismic, aeromagnetic, wireline, and hydrologic data to assess subsurface geology and reservoir compartmentalization. The input of these data into numerical modeling and visualization tools is greatly refining our estimates of the sequestration potential of the continental flood basalts of the CRBG, and is providing methodologies for evaluating basalt reservoirs elsewhere.