From CO_2 to Stone: A Feasibility Study of Deep-Sea Geologic Carbon Storage in the Juan de Fuca Plate

[1]H. Garcia, [2]D. Goldberg, [2]A. Slagle

[1]University of Delaware, [2]Lamont-Doherty Earth Observatory of Columbia University

The possibility of offshore geologic carbon sequestration, as presented by the CarbonSAFE project, is a unique, safe and abundant solution to mitigating global climate change. By capturing and injecting atmospheric CO_2 in deep-sea basalt reservoirs, the CO_2 currently heating and changing our environment would instead mineralize beneath the seafloor forming stable carbonates through reactions with the ocean crust. The presence of vast pillow basalt formations created by nearby ocean spreading systems in the Juan de Fuca Plate and the proximity to potential CO_2 partner sources make the target area a promising candidate for this long-term climate solution. The scope of existing scientific research in the area from Ocean Drilling Program (ODP) and International Ocean Discovery Program (IODP) expeditions and other studies provide an extensive amount of background knowledge to help assess the viability of future pilot injections and larger scale operations. In order to determine the feasibility and storage potential of these next steps, we have collected and evaluated a wide range of data types concerning CO_2 -basalt mineralization reactions, the regional geologic setting and physical properties like porosity and permeability. The availability of these data types, and numerous others, have pointed to existing gaps in knowledge, areas in need of further investigation and possible risks associated with carbon sequestration. One such risk lies in the natural seismicity of the subducting Juan de Fuca Plate. By mapping and evaluating the proximity of past seismic events to the projected injection reservoir we determined that this associated risk does not hinder the viability of carbon storage in this area. The wide range of data types compiled in this study will allow for additional evaluations addressing the feasibility of turning CO_2 emissions into stone deep within the Juan de Fuca Plate.