CO_2 Storage Site at a Volcanic Sill Structure in a Sedimentary Basin in the Korean Continental Shelf, Yellow Sea

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Abstract

Recently, the international issue has focused on reducing greenhouse gas emission, especially CO_2. CCS (CO_2 capture and storage) technology has been known as the most economical way among low-carbon technologies to cope with the global climate change because CCS technology is expected to play a role in global CO_2 reduction about 20% until 2050. The Korean government selected CCS technology as one of the main supporting technologies and planed for reducing CO_2 emission to 30% including CCS technology by 2020. In a view of storage technology, we have performed a demonstration project for a pilot-scale (10,000 ton) CO_2 geologic storage in a sub-sea sedimentary basin. The main objective of this study is to select candidates for CO_2 storage site in a marine basin. We have performed geophysical surveys to select candidates for CO_2 storage site in a marine basin and have analyzed previously acquired geological and geophysical data. We identified volcanic sills capable of storing CO_2 in a stable state from analyzing multi-channel seismic data and previous well log data. These basalt sills represent an anticlinal shape and plays the role like the cap rocks in the oil reservoirs. The sills are generally located 900 to 1,200 m below the seafloor and above the tectonically stable Cretaceous basement. The volume of the sills is about 6,800,000,000 m^3, total porosity and effective porosity of the sills as an aquifer layer are about 40% and 29%, respectively. Considering the above conditions of the sedimentary layer for CO_2 sequestration, it is adoptable for the sills to be the most efficient for CO_2 sequestration. We approximated site specific level coefficient ranging 0.04 to 0.17 and the resulted storage capacity from 55 million CO_2 ton to 233 million CO_2 ton. Considered that the critical density of CO_2 is 700 kg/m^3, those specific level coefficients give about 150 million CO_2 ton as the average storage capacity. Also, these basalt sills have formed the affordable condition for the permanent sequestration of CO_2 by CO_2 mineralization. We identified additional similar structure in the northwestern region and have concluded there are possible areas of CO_2 sequestration developed around the study area.