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Assessment of CO_2 storage capacity for basalt caprock-sandstone reservoir system in the northern East China Sea

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Estimation of carbon dioxide (CO_2) storage capacities in the northern East China Sea (ECS), which is one of the largest marginal seas in the world and divided into several deep sedimentary basins and basement highs, has been performed in basin scale using CO_2 storage efficiency. However, detailed studies on traps, caprocks and reservoirs, those are essential for the selection of CO_2 geological storage sites, are insufficient. We have identified a stratigraphic trap for potential CO_2 storage where sandstone reservoir is overlaid by basalt caprock on tectonically stable Cretaceous basement high of the northern ECS through analysis of 2D multichannel seismic and well data. The basalt formation forming anticlinal structure is located at about 1,000 m depth from the seafloor and distributes over about 84.9 km^2. Below the basalt formation, a high porous sandstone reservoir which is suitable for the efficient storage of CO_2 is developed with 60 $\sim$ 100 m in thickness. 3D geological model is constructed for volume estimates of reservoir and reservoir property is derived from well-log evaluation. The estimated geologic CO_2 storage capacity for the potential sandstone reservoir covered by the basalt caprock ranges from 59.4 to 248.3 Mt of CO_2 with an average of 153.4 Mt of CO_2. Furthermore, we expect additional storage capacity for the basalt caprock-sandstone reservoir system because considerable amounts of CO_2 can be stored in basalt formation through mineral carbonization reactions as well as in conventional sandstone reservoir. A recent 2D seismic survey conducted in the northeastern part of ECS reveals that basaltic rocks are distributed in large area ($\sim$ 680 km^2). Therefore, the basaltic formations are expected to be utilized either as sealing caprocks or as permanent sequestration reservoirs by mineralization for CO_2 geological storage in this region.