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Initial Plan of CO_2 Marine Transport and Release into Deep Waters Allowed for Rough Sea State

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Summary: Ocean storage of the captured CO_2 from fossil-fuel burning is a possible option for mitigating the increase of CO_2 concentration in the atmosphere. Moving-ship type of CO_2 ocean storage is a concept whereby captured and liquefied CO_2 is delivered by ship to a site and injected into the deep ocean by means of a pipe suspended beneath a ship as it slowly moves through the water. In case of bad weather conditions, CO_2 marine transport and operation on the sea should be adjourned although CO_2 would be captured at the plant every day. It is, therefore, required that the system would have the buffer storage at the port and the extra shipping ability to recover the delay of schedule. Since the large scale of such spare capability might lead to the increase in cost, it is needed to investigate how to plan the system allowed for weather conditions reasonably. In this study, a time series model of sea state through one year is generated for a hypothetical ocean storage site, based on the wind data observed with satellite remote sensing, and simulations of CO_2 marine transport and operation on the sea are carried out considering the operational limit of sea state. In this approach, the continuing bad weather days or the frequent occurences of rough sea condition during the specific season are counted automatically. In order to pursue higher efficiency of the operation, side-by-side type and tandem type of moorings are applied for the simulations and compared. Finally, cost assessments under the several assumptions are carried out to see the relative merits among that number os ships would be increased, that the loading capacity of a ship would be increased, and that the storage capacity at the port would grow, which are generally in trade-off relationships.

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