

Reprocessing of Controlled-Source Seismic Data from New Zealand Hikurangi Margin Offshore East Coast Basin

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Abstract

This reprocessing project is a preparation for high resolution velocity analysis that aims at detecting gas hydrates on the Hikurangi margin in East Coast Basin, New Zealand. Recently, gas hydrates have been recognized as a type of unconventional petroleum resource. Several projects of production testing have been finished by Japan and other countries. Depressurization method has been suggested as a commercial method for producing gas from hydrates. Therefore the potential deposits of gas hydrates in East Coast Basin could be a significant future energy resource for this country.

In this project the seismic data is from Bruin 2D Seismic Survey, which was recorded in 2006. Five lines that have clear bottom-simulating reflections (BSRs) were chosen to be reprocessed because the BSR indicates the presence of gas hydrates. The velocity model used in this project is from previous processing. The main steps that were included in the reprocessing are: geometry application, near trace stack, FDMIG (Finite difference time migration), frequency filtering and statics, preparation of data for pre-stack time migration and finally pre-stack time migration.

The results show that the reprocessed seismic data has a higher resolution than that in the previous data. The faults that could be the path for the migration of gas are easier to be identified in the higher resolution seismic data. More specifically, the identification of faults is good for understanding the migration of gas into the gas hydrate stability zone. Double BSRs were observed in the reprocessed seismic data. There are several reasons can be used to explain the presence of the double BSRs. The double BSRs could be caused by the uplift of seafloor. The mixture gas that can increase the critical temperature for the formation of hydrate could form the double BSRs as well. The last reason could be that the lower BSR is the residual BSR that is based on the concentration of free gas trapped in the sediment below remains large enough for the lower BSR to be reflective.

In order to further detect the gas hydrates, high resolution velocity analysis will be used in the future works. The expected result of the whole project will show a map of BSRs and velocity structure in the research region. The study of double BSRs also offers an opportunity to reveal a relationship between gas hydrates and deep conventional petroleum system that is beneath the gas hydrates.