ONLINE ISSN : 1881-4824
PRINT ISSN : 0912-7984

BUTSURI-TANSA(Geophysical Exploration)
Vol. 58 (2005) , No. 1 pp.41-49

Random heterogeneous model with bimodal velocity distribution for Methane Hydrate exploration

Rie Kamei[1)], Masami Hato[2)] and Toshifumi Matsuoka[1)]

1) Department of Civil and Earth Resources Engineering Graduate School of Engineering, Kyoto University
2) JGI Inc.

(Manuscript received August 9, 2004)
(Accepted November 18, 2004)

ABSTRACT We have developed a random heterogeneous velocity model with bimodal distribution in methane hydrate-bearing zones. The P-wave well-log data have a von Karman type autocorrelation function and non-Gaussian distribution. The velocity histogram has two peaks separated by several hundred metres per second. A random heterogeneous medium with bimodal distribution is generated by mapping of a medium with a Gaussian probability distribution, yielded by the normal spectral-based generation method. By using an ellipsoidal autocorrelation function, the random medium also incorporates anisotropy of autocorrelation lengths. A simulated P-wave velocity log reproduces well the features of the field data.

This model is applied to two simulations of elastic wave propagation. Synthetic reflection sections with source signals in two different frequency bands imply that the velocity fluctuation of the random model with bimodal distribution causes the frequency dependence of the Bottom Simulating Reflector (BSR) by affecting wave field scattering. A synthetic cross-well section suggests that the strong attenuation observed in field data might be caused by the extrinsic attenuation in scattering.

We conclude that random heterogeneity with bimodal distribution is a key issue in modelling hydrate-bearing zones, and that it can explain the frequency dependence and scattering observed in seismic sections in such areas.

Key words: methane hydrate, bimodal distribution, random heterogeneous,

autocorrelation, BSR

To cite this article:

Rie Kamei, Masami Hato and Toshifumi Matsuoka (2005): Random heterogeneous model with bimodal velocity distribution for Methane Hydrate exploration , BUTSURI-TANSA (Geophysical Exploration), **58**, 41-49 .

doi:10.3124/segj.58.41

JOI JST.JSTAGE/segj/58.41