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**BUTSURI-TANSA(Geophysical Exploration)**

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[\[PDF \(2850K\)\]](#) [\[References\]](#)**The simulation of acoustic wave propagation by using characteristic curves with CIP method**Kazuya Shiraishi<sup>1)</sup> and Toshifumi Matsuoka<sup>1)</sup>

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**ABSTRACT** In this paper, we applied the CIP (Cubic Interpolated Profile) method to the propagation phenomena of an acoustic wave based on the characteristics. The CIP method is a highly accurate method to solve advection equations, which has been used in a numerical fluid dynamics and plasmas phenomena simulations. It can simulate wave propagation phenomena along characteristic curves by solving the advection equations numerically. The key idea of the CIP is that not only the physical value itself but also its first spatial derivative obeys the same advection equations.

In order to apply this method to the wave simulation, we derived the combined advection equations by means of transformation from basic equations. We also compared the CIP method with other finite difference schemes about the stability of the methods, numerical dispersions, calculation times, and accuracy. The CIP method shows little numerical dispersions in cases of the difficult conditions as the input wavelet is discontinuous and it has high frequency components. Finally, we recognize the CIP method is a very useful simulation technique to deal with wave phenomenon in geophysics.

**Key words:** CIP method, characteristic curve, acoustic wave propagation

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