Transform of full wave equation

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Full wave equation

$$\frac{\partial^2 P}{\partial x^2} + \frac{\partial^2 P}{\partial z^2} - \frac{1}{v^2}\frac{\partial^2 P}{\partial t^2} = 0 \qquad (1)$$

Eliminating the second derivatives of t and z by LINEAR TRANSFORM

The transform (one of them):

$$\begin{cases} x' = x \\ z' = z + vt \\ t' = t/2 - z/2v \end{cases} \qquad (2)$$

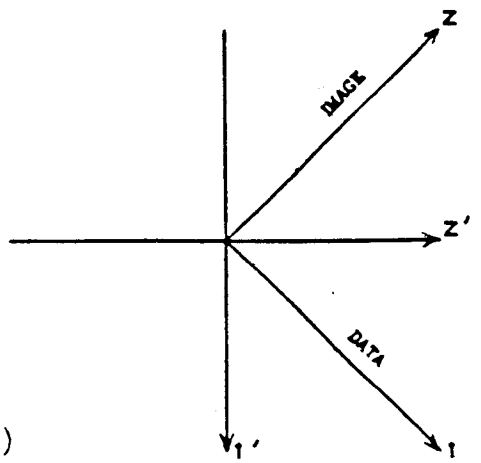
Transformed equation

$$\frac{\partial^2 P}{\partial x'^2} - \frac{2}{v}\frac{\partial^2 P}{\partial z' \partial t'} = 0 \qquad (3)$$

Finite differencing in the new coordinate system

Data : $z' = 2vt'$

Image : $z' = -2vt'$



(more detail on the 1984 September report of SEP)