

The Effect of Vp/Vs on Prestack and Poststack P-S Time Migration

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Modern processing of P-S converted-wave data requires the estimation of several different types of Vp/Vs ratios for taking into account layered anisotropic effects, such as the ratio of average vertical P and S velocities, γ_0 , the ratio of P and S stacking velocities, γ_2 , and the effective Vp/Vs, γ_{eff} , which is used for stacking. With poststack migration processing of P-S data, reflections can be flattened within CCP gathers even though the estimation of vertical Vp/Vs, which usually is estimated from the correlation of corresponding events on P-P and P-S stacks, may be quite wrong. This allows poststack migration processing to be quite robust--it can produce coherent images even with poor estimates of the relevant Vp/Vs ratios.

In contrast, prestack P-S time migration imaging is more sensitive to the estimation of the Vp/Vs ratios. A minor (3-5%) inaccuracy in vertical Vp/Vs can be partly compensated by an adjustment in the Vp/Vs ratios used for migration in order to produce a good image. However, with a more severe error (10%) in vertical Vp/Vs, no good image can be obtained. So not only can prestack P-S migration provide better imaging of steeper dips, but it is a valuable method of confirming whether correlations of P-P and P-S events have been done correctly.