Improved AVA imaging in complex media

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The relation between AVA-effects, present in seismic data, and the angle dependent reflectivity becomes complicated when the layer thickness becomes smaller than half the wavelength. In this case, the Zoeppritz equations predict another AVA-behaviour than present in the seismic data. This is because these equations consider the reflecting boundaries as being isolated, which is, obviously, no longer justified.

The AVA-effects due to fine-layering can be subdivided in propagation and reflection related effects. We follow here the subdivision that is already present in the primary WRW-formulation of Berkhout. The propagation of a wave through a finely layered structure is accompanied with wavelet *dispersion*. The reflection of a wave in a finely layered structure is accompanied by wavelet *interference*. This latter effect depends on the angle of incidence as well. Wapenaar et al. studied and discussed these phenomena extensively for one-dimensional acoustic media. In this paper methods were discussed that equalize the effects of the AVA-behaviour.

In our project, we aim to study the extensions of these one dimensional methods to two and three dimensions for the acoustic and the elastic case. Presently, we are focussing on the reflection related AVA-effects in two and two-and-a-half dimensional acoustic media. In other words, we intend to create a true amplitude angle-dependent migration scheme that equalizes the effects due to fine-layering for reflection related effects. This is achieved by applying a filter through which the medium is observed by the same spatial wavelength.

At the workshop we will demonstrate the extension of this method in more dimensions. We are planning to achieve this in a model that is depicted in figure 1. At the target zone of this model a finely layered structure is located, which is tilted with an angle. This structure consists of laterally homogeneous layers. Above this structure we may have an arbitrary overburden. Using the proposed method the target zone will be imaged with an improved amplitude behaviour in the imaged sections. As an example, in figure 2 a reflectivity section (a), an unfiltered (b) and filtered (c) migration result in one dimension are shown. From this picture it will be clear that reflection related AVA effects are equalized by the new method of filtering.

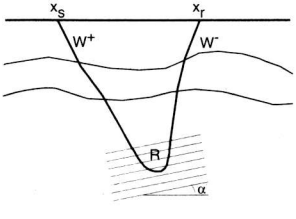

fig: 1

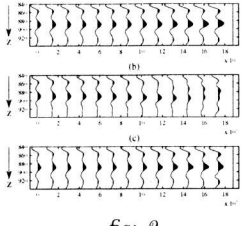

fig: 2