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Seismic window

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More seismic attributes

A recent upgrade of my seismic interpretation software not only had the usual bug fixes or enhancements, it also came with a new seismic attribute calculator. 'Great' I thought, 'all I need is another attribute to add to the ever increasing list'. But this one was different because I had never come across it before and had no idea what it did or how it worked. Originally called 'tecva' this is a fairly old post stack attribute that was developed in Brazil in the early 1980s. The implementation I have now calls it 'pseudo – relief' and in an attempt to learn more about it I found a copy of a paper explaining how it is calculated (Bulhoes, 2005). It's not an easy paper to read because it's written in Portugese, but non Portugese speakers can get the general gist by feeding each paragraph into Google translator.

Pseudo-relief is really quite a simple attribute. I think it is essentially a RMS amplitude calculated over a small window (half a wavelength) of a quadrature trace, but my translation may be wrong. Figure 1 displays a pseudo-relief section alongside normal seismic and a RMS amplitude section. RMS

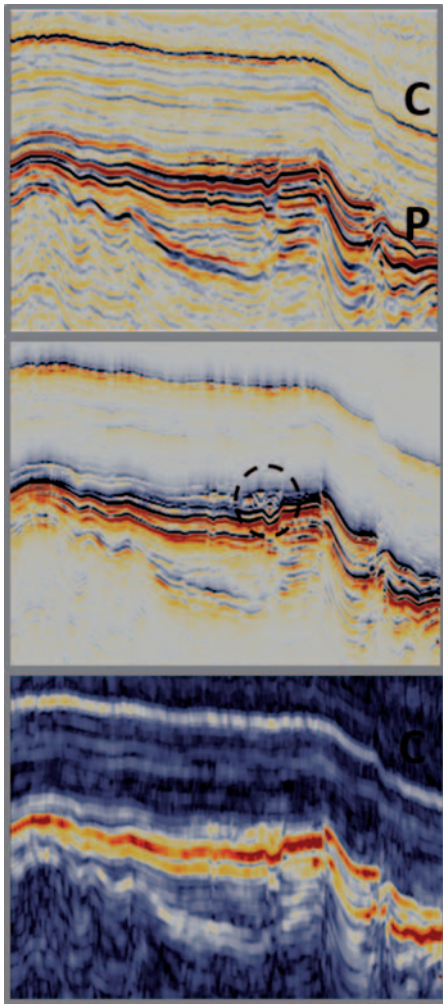

Figure 1. *Pseudo-relief (centre) compared to seismic data (left) and RMS amplitude (right) calculated over an 18 ms window. The pseudo-relief enhances the channel-like feature circled. The data are from the Jackson Field, Queensland.*

tends to enhance high amplitudes and pseudo-relief certainly does that and it

Are there too many seismic attributes?

appears to have improved resolution. Figure 2 is a zoom into a channel-like feature visible on the pseudo-relief

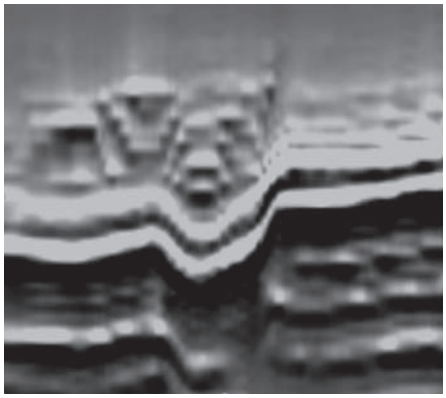

Figure 2. *Close up of the channel-like feature just above the strong P reflection that can be seen in Figure 1.*

section showing the detail and multiple channel fill events.

Having reviewed this attribute two questions spring to mind:

Are there too many seismic attributes? Is this one any better than the others?

Being a fence sitter my answers are both yes and no. Yes, there are too many attributes to run them all on each dataset and no, this one is no better than the others. But it worked at the time and may be useful in particular situations, which is the case for most seismic attributes. Interpreters have access to many hundreds of seismic attributes on their desktops (Figure 3 is a compilation of just some of the edge detection attributes available). While we may not have time to use them all, an appropriate choice can make it easier to understand the geology and convey our ideas to work colleagues and management.

Reference

Bulhoes, E. M., 2005, Principio da SismoCamada Elemantar e sua aplicacao a Tecnica Volume de Amplitudes (tecVA). Ninth International Congress of the Brazilian Geophysical Society.

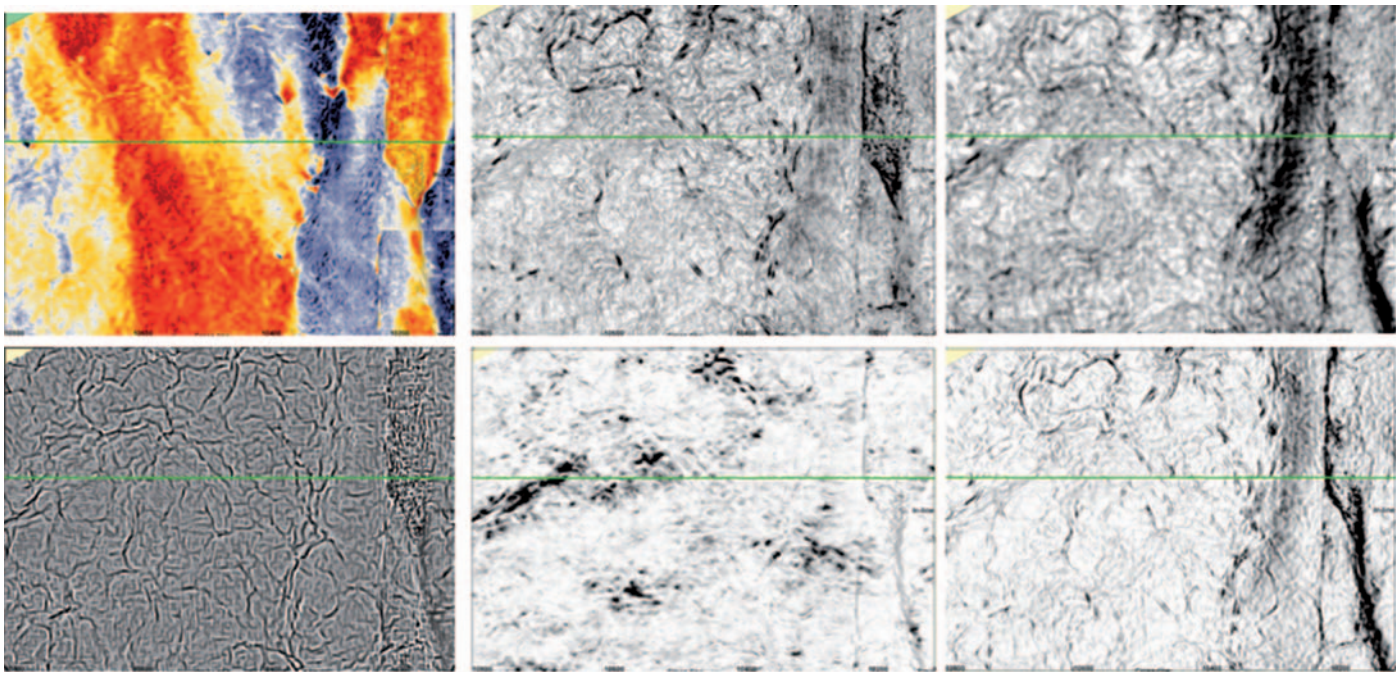

Figure 3. *A sample of the many edge detection attributes available. Clockwise from top left: seismic amplitude, similarity, dissimilarity, semblance, fault likelihood and maximum curvature. Attributes are calculated along the strong reflector near the top of Figure 1 (line location shown in green).*

*This **Askania magnetometer** from the ASEG virtual museum is probably the oldest item in the collection. It was generously donated by John Stanley, formerly lecturer at the University of New England and inventor. Such instruments were built in the late 1920s and 1930s by Askania Werke of Berlin, Germany, and only measure only the vertical component of the field. A separate version measured the horizontal component. The resolution of 2 nT was considered to be very sensitive when first available and it superseded the use of dip needles with a 1000 times improvement in sensitivity.*

Operation of this variometer first required levelling the instrument on its tripod using two spirit levels. Instrument temperature was recorded from an internal mercury thermometer for the purpose of applying a compensation correction. The relative vertical magnetic force was measured off a graduated scale viewed through a microscope. Calibration scale and temperature compensation factors are not known for this instrument. Setup and measurement time at each station is estimated to be one minute for an experienced operator.