**Processing challenges in unconventional plays**

On the heels of the 2017 SEG workshop on the role of geophysics in unconventional plays, the present talk will consider a small, but important, subset of that workshop theme, namely seismic processing challenges which arise in unconventional reservoir development. While some of these challenges—for example the ubiquitous quest for higher frequencies--were earmarked as important topics long before the advent of the unconventional realm, others-- such as azimuthal imaging and low-frequency preservation--have seen a relatively recent ascent to prominence correlating directly with the unconventional boom. Collectively these processing challenges have cast renewed focus on some existing tools and concepts (e.g., AVO-compliant processing, refraction statics, deconvolution and coherent noise suppression), while forcing rapid adoption of new technologies like 5D interpolation.

For example, the images below demonstrate the reinvigoration of an existing AVO-compliant processing algorithm known as surface-consistent (SC) amplitude scaling. Specifically, these images show the action of a novel type of SC scaling, essentially a frequency-dependent extension of the unbiased scaling approach of Nagarajappa and Cary (2015), applied to a dataset shot over the the Kansas Mississippian Trend. Figure (a) shows f-x amplitude spectra (top) and time-domain stack (bottom) before applying the scaling and Figure (b) shows the corresponding displays after scaling. Note the improved continuity in bandwidth and improved amplitude balancing on the stack in (b) after applying the new technique.
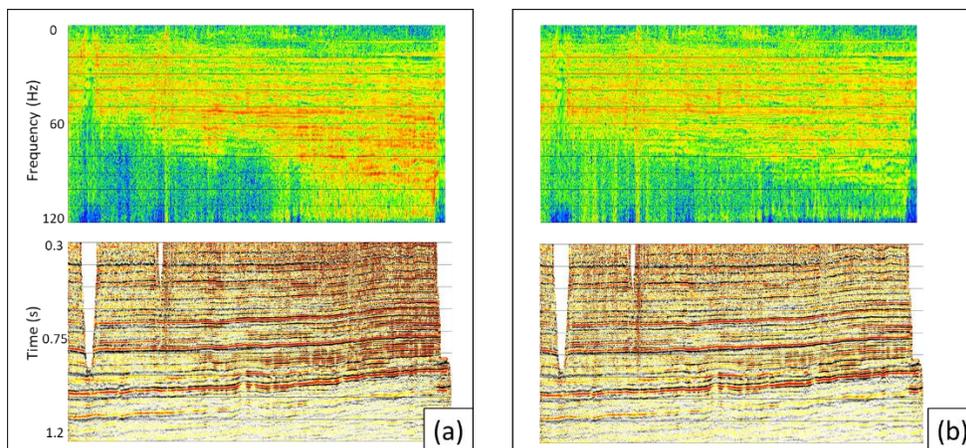
Data courtesy TGS

The talk will begin by examining key processing requirements specific to the unconventional world. Next it will describe state-of-the-art technologies aimed at addressing those requirements, including the tools mentioned above. Finally it will consider emerging trends in the way we are using 3D seismic in unconventionals, such as compressive sensing and pre-stack depth migration, and will speculate on how those trends might impact our current processing flows. Real data examples will be shown throughout, and the presentation will end with a candid overview of outstanding challenges.

References

Nirupama Nagarajappa* and Peter Cary (2015), Unbiased surface-consistent scalar estimation by crosscorrelation. SEG Technical Program Expanded Abstracts 2015: pp. 2337-2341.