From: (null)
Subject: New seismic processing and acquisition research projects at UH focus on providing broader bandwidth data and improved reservoir detection and delineation
Date: April 20, 2018 at 2:45 PM
To:

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Dear Sponsors, Colleagues and Friends,
For your possible interest, please see the note below.
Thank you.
Warmest best regards,
Arthur

Arthur B. Weglein

New seismic processing and acquisition research projects at UH focus on providing broader bandwidth data and improved reservoir detection and delineation

Background

The ability to: (1) broaden the bandwidth of seismic data and (2) to deliver that enhancement to the target and reservoir have clear and well recognized benefits for more successful exploration, appraisal and development well placement. There are several fundamental seismic research projects in the physics department at UH that identify challenges in that arena and deliver new capability and effective solutions.

A major seismic challenge: the influence of the absorptive and dispersive subsurface on seismic data

Among the longstanding, significant and most impenetrable and serious challenges in exploration seismology is the loss of seismic wave amplitude due to the absorptive and dispersive nature of the subsurface. The returning reflected wave will have a greater reduction in amplitude for higher frequency components compared to lower frequency components. That loss of high frequency data components will have a deleterious effect on seismic resolution, and discourages acquiring higher frequency data, under precisely the circumstances where higher resolution is needed. One reason for the strong interest in additional low frequency data is that it is the only data that often survives, for example in a pre-salt play where the reflected wave has experienced the highly absorptive salt layer(s).

There is a long history and many approaches exist that attempt to try to estimate the absorptive mechanism, and to then compensate for the attenuation due to absorption. The accurate estimation of absorptive properties is very difficult with a checkered history of success, and where small errors can result in noise being amplified, and overall

unstable results.

A new and practical approach to addressing that problem: Q compensation without knowing, estimating or determining Q

Dr. Yanglei Zou and Dr. Arthur Weglein of M-OSRP in the Physics Department have recently advanced a new and practical method that can compensate for the absorption experienced in the subsurface without needing to know, or to estimate or to determine anything about the absorptive mechanism. It is hard to overstate the significance of that advance.
That Q compensation will benefit all frequency components of the reflection data and in particular will boost the high end of the frequency spectrum. And that will encourage new acquisition methods to acquire higher frequency data.

Implications beyond seismic: probing with electromagnetic waves

That development also has significant positive implications for electromagnetic exploration, where absorption and dissipation can be even more serious, and dominate the propagation terms in the governing equations.

New developments in seismic acquisition: generating and recording lower frequency data

A new faculty member in the physics department, Professor Mark Meier is developing a new lower frequency source and receiver, for marine and on-shore plays, providing lower frequency data than is currently available in the petroleum industry. Dr. Meier is planning a new petroleum industry consortium , to fund and support his fundamental seismic acquisition research.

Delivering the benefits of conventional and broader bandwidth data to the target and reservoir: the first migration that doesn't discount low frequency data components

Migration is the method that inputs recorded seismic data to locate and delineate targets and reservoirs.
All current migration methods including all RTM methods make high frequency approximations. The consequence is that the migration methods employed today are less effective with lower frequency components.
That has resolution consequences with conventional seismic acquisition. In addition all current migration methods discount the potential and value of lower frequency recorded data.
M-OSRP has developed the first migration method for heterogeneous media that is equally effective at all frequencies. Those pioneering that capability and delivery within M-OSRP include: Weglein, Stolt, Fang Liu, Yanglei Zou, Qiang Fu, Chao Ma, Jing Wu, Jingfeng Zhang, Jose Eduardo Lira and Jim Mayhan.

Progressing and advancing seismic acquisition and processing for a comprehensive and consistent approach to E&P challenges

That new migration method from M-OSRP provides added value for identifying and delineating reservoirs, beyond the current industry top-of-the-line RTM migration.

That impact and delivery is for conventional seismic acquisition and with yet greater relative value for lower frequency broad band data that Professor Mark Meier and his team will provide.

An overview can be found in http://mosrp.uh.edu/news/executive-summary-progress-2017 and will be discussed and presented at the 2018 M-OSRP Annual Technical Review June 5 and 6th at UH http://www.mosrp.uh.edu/news/invitation-to-the-2018-m-osrp-annual-technical-review.