Name: Aleksandr Nikitin
Company: Geology Without Limits
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Introduction

Velocity is a key to clear seismic image and reliable time to depth conversion. Sadly, based on overall experience, seismic data acquired during towed seismic streamer surveys doesn't perfectly suit for velocity model building routine. In complex geological environments velocity models built from streamer data tend to be even less reliable. Thus, seismic surveys results are not robust and prospects do not de-risked.

Full Waveform Inversion (FWI) (Tarantola, 1984) is a game changer approach for velocity model building. FWI can produce significant seismic image uplift and can potentially help simplify the labor-intensive salt-model building (Chao Peng et al., 2018).

The important stipulation is that the majority of impressive results achieved by FWI were accomplished on synthetic data. The reason is that CDP method drives standards for seismic equipment. Streamer length is limited by 12 km and seismic source usually has dominant frequency of about 30-40 Hz. Data sets acquired with such parameters are not able to unleash the whole potential of FWI approach. A new acquisition platform for long-offset and low-frequency data acquisition for FWI velocity model building is required.

Method and Acquisition technique

The new concept of dedicated velocity model building seismic surveys is based on two specially developed tools: GWL LF Source™ – able to emit low frequency energy beneficial for deep penetration of seismic signal and GWL Seismobuoy™ – compact and easy to handle standalone unit to record ultra-long offset seismic data from deep buried structures. The first goal of the development was to design equipment suitable both for simultaneous use during conventional towed seismic streamer surveys as well as for separate velocity model building surveys using small tonnage vessels of opportunity. The second, but not less important goal was to increase production rate of such kind of surveys and considerably reduce price per km of acquired data without any loss of data quality or operational integrity.

Conclusions

The new equipment specially designed for the ultra-long offsets and low frequency data acquisition can set aside a separate equally important data acquisition such as velocity surveys. The separate velocity survey has to be fast and inexpensive, providing us with an accurate velocity model before the start of a towed seismic streamer survey. Such velocity models can be interpretable by themselves and be used to amend towed streamer survey design, be applied for streamer data processing and migration considerably reducing time span from the first shot to the final product delivery.

References

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