

SeisWare Case Study: Making waves in the world of seismic acquisition

OptiSeis is driving seismic acquisition to lower environmental impact – and SeisWare is there to help.

OptiSeis is making waves. Both figuratively and literally. Over the past few years, OptiSeis has been researching new ways to make 3D seismic acquisition more environmentally friendly, focusing on maintaining image quality.

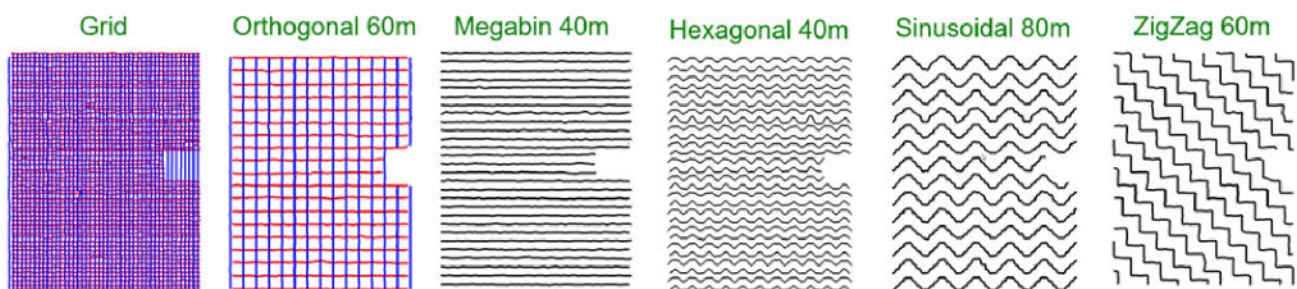
In the past, seismic was acquired through wide cutlines for sources (vibration-producing equipment or explosives that generate seismic waves) and receivers (sensors that record waves reflected from deep rock layers). This approach has left a network of interconnected cutlines that can be slow to regrow and may disturb wildlife and their habitats. The environmental impact from seismic acquisition has been minimized over the last twenty years by shifting to new technology such as GPS-guided line cutting, miniaturized seismic sources, and simultaneous acquisition.

OptiSeis is working to make another step change in 3D and 4D seismic acquisition. They are focusing on lower footprint survey geometries and leveraging advances in processing algorithms to predict missing information. This work opens

the door to new acquisition geometries with the benefit of a lower carbon and land footprint, consistent target resolution, and increased field efficiency [1].

Each test geometry is created by decimating a dense grid layout. Decimated surveys generate large volumes of data that need to be processed and interpreted consistently and reliably. Many linear-inspired geometries, like sinusoids, hexagonals, and zigzags, were explored (Figure 1). So far, more than 20 different acquisition geometries have been tested, all requiring careful scrutiny.

The search for the optimal seismic design is no simple task. The tests generate several seismic volumes. Each requires well tie analysis, horizon picking, flattening, and slicing at critical intervals. For each volume, several attributes (like time amplitude, instantaneous phase, and frequency) are compared to assess the quality of each potential design – see Figure 2 for a flavor of this!



Different acquisition geometries using lines of sources and receivers are shown. Grid, orthogonal, and Megabin are common geometries, while hexagonal, sinusoidal, and zigzag geometries are being explored by OptiSeis.

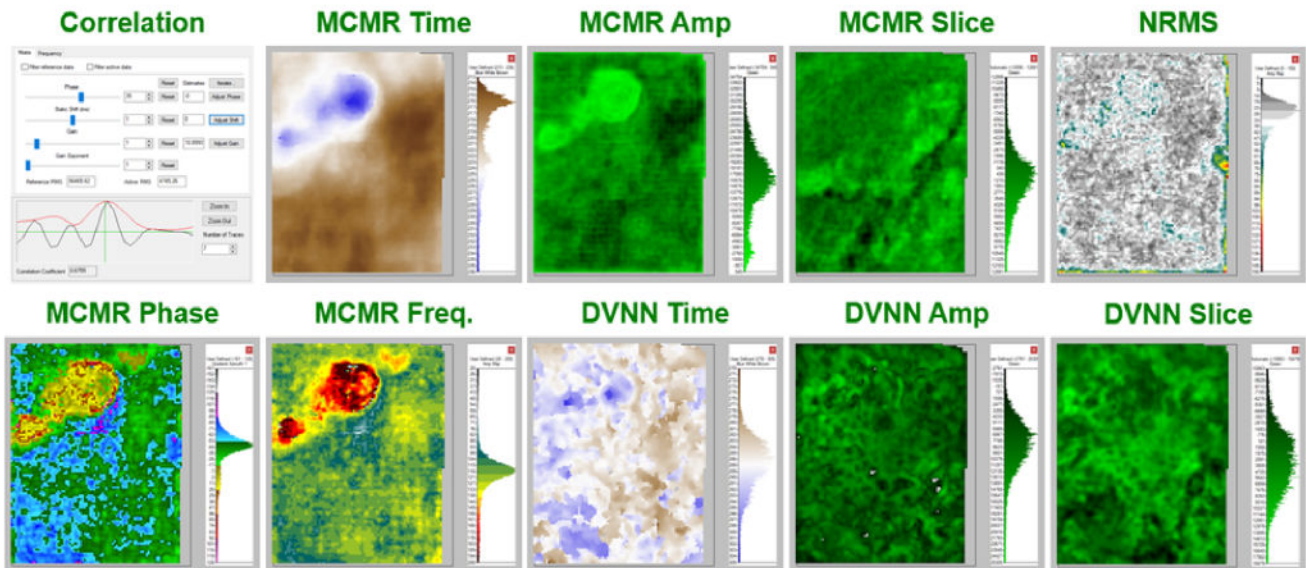


Figure 2: A snapshot of attributes generated in Geophysics by SeisWare that are being used by OptiSeis to assess geometry efficacy and suitability.

All the attributes were compared back to the undecimated and orthogonal surveys in the search for geometries that create the best balance between data quality and a lower environmental footprint. The process of comparing and quantifying the differences has been critical to the success of the project. OptiSeis requires software that enables them to perform repeatable workflows and one that works reliably every time. That’s where SeisWare comes in (they don’t call SeisWare “Industrial Strength Software” for nothing!)

When you’re working with a large number of datasets, you also need time to be on your side. From quick well ties to fast automated picking, OptiSeis has been able to blast through a lot of data relatively quickly. Professional Geophysicist and Senior Project Manager of OptiSeis, Peter Vermeulen, says that Geophysics by SeisWare has been user-friendly and intuitive, enabling him to move his project forward. “It’s reliable software that has provided the comprehensive analysis we need to demonstrate that our industry partners can focus on their environmental goals without losing focus of their reservoir”, says Peter.

Through diligent work, OptiSeis has narrowed down its optimal geometries and moved on to a new phase in its acquisition journey. This winter,

they acquired their first EcoSeis 3D seismic data to test environmental performance, operational efficiency, and imaging quality. The interpretation work will lean heavily on the world-class performance of Geophysics by Seisware to provide the answers they need, on time.

OptiSeis is demonstrating that operators can focus on all their targets, whether subsurface or environmental, and SeisWare is pleased to support them in their efforts. To learn more about the application used by OptiSeis, Geophysics by SeisWare, please visit our Geophysics Page or reach out to see how SeisWare can fuel your work.

Acknowledgments

SeisWare thanks Peter Vermeulen and the OptiSeis team for sharing their story and for the gracious use of their images. OptiSeis’ work has been supported by Cenovus, Key Seismic, Alberta Innovates and COSIA.

References

[1] Naghizadeh M. [et al], EcoSeis: A novel acquisition method for optimizing seismic resolution while minimizing environmental footprint, TLE 2023