Depth on Demand—Fast Beam Migration, Smart Flood™, and Integrated Visualization for Improved Velocity Depth Model Building

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ABSTRACT

Our industry is facing ever-shorter time frames to address a problem of increased complexity: maturing a prospect from initial access-level exploration into a de-risked mature prospect ready for well planning and drilling. Some of the challenges in this process come from handling large regional-scale high-quality seismic datasets that are now available, to managing the computer time needed to make high-fidelity images of the subsurface. Model building typically relies on human interaction and can be a bottleneck in this process, involving multiple software platforms and time-consuming data logistics.

Here, we will present a set of tools that we find are very well suited to address this challenge. Through our beam-migration approach, we are able to image large datasets very rapidly and accurately with a large migration aperture and with a full dip-range. The beam-migration process is separated into two main components: (1) a dipscan process that is performed once for the whole survey and which output is then stored on disk for later use, and (2) a fast migration step is carried out "on-demand" or through multiple model iterations. With modern computer hardware, this imaging step can be performed in almost real-time. We will also present beam-based imaging techniques that allow for improved salt interpretation in complex regions through the use of a unique Smart Flood™ process.

By integrating these capabilities with a 3D visualization system that can handle the full range of scales from basin-size seismic to detailed interpretation and model building, we are shortening the cycle time and greatly reducing the data-logistical overhead. The data can reside in this system from the early mega-regional stages through to prospect-specific model building and imaging projects, where also other imaging algorithms such as one-way wavefield extrapolation migration and reverse-time migration can be applied.

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