Determining Depositional History through use of Cognitive Interpretation Workflows

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Abstract

Cognitive Interpretation is a method of understanding geology before interpreting seismic that harnesses our natural cognitive capabilities. Cognitive Interpretation combines the power of algorithmic computation within software with the benefits of an interpreter's knowledge and experience. About 40% of the brain is devoted to visual cognition and there are strong links between visual system and memory. Because of this, the brain effectively links current visual data with past experience and learnings in order to make sense of incomplete or ambiguous data. This linking of visual data and past learnings is what seismic interpreters do with data, by pattern matching what is seen with what geological features are known to look like. In this study, reflectivity data was directly translated into geological information, before any traditional line-by-line interpretation.

During a regional reconnaissance project, a seismic anomaly was discovered in the Northern Graben of the Taranaki Basin, New Zealand (Hansen & Kamp, 2006, 2008), the origin of which caused much discussion. The depositional history of this anomaly was deciphered quickly through the use of software and workflows that are designed to support Cognitive Interpretation.

A top surface interpretation was tracked using an adaptive interpretation method. To get a better understanding of the depositional history, iso-proportional slices conformant to the interpretation was created. From these slices, the geology of the anomaly is interpreted to be a crevasse-splay from a larger channel event. Using Cognitive Interpretation workflows, a rapid understanding of the depositional history of this bright anomaly was determined. The ability to interactively slice through the RGB blend volumetrically enabled the team to visualize and hence understand the depositional evolution of the channel and fan systems. Being able to confidently interpret the relationship between the fan and the channels that feed into it would not have been possible by simply creating a surface on the high amplitude anomaly.