

3D seismic geomorphology of paralic channel complexes, Sable Sub-basin, offshore Nova Scotia, Canada

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Extensive fluvial systems drained expansive areas of present-day Canada throughout the Late Jurassic to Late Cretaceous and deposited over 12 km of sediment within the Scotian Basin, offshore Nova Scotia. In the Early Cretaceous Logan Canyon Formation and to a lesser extent, the underlying Missisauga Formation, these fluvial complexes are prominent and imaged in the ExxonMobil 3D seismic data cube known as the Sable Megamerge. The fundamental objective of this research is to observe the temporal and spatial fluvial system architectural variations, with an appraisal of the controlling features that are affecting this variability. This will be achieved by integrating sequence stratigraphy and seismic geomorphology within the 3000 km² study area.

The seismic data cube was flattened on two surfaces representing the tops of the Logan Canyon and Missisauga formations. The process converts the seismic time slices into seismic horizon slices, showing sedimentary features in the depositional system. Seismic attributes are then applied to allow the fluvial systems and their associated architectural elements to become more distinct on the horizon slice images. These are combined with quantitative seismic geomorphology to obtain fluvial architecture parameters: channel width (CW), channel thickness (CT), meander-belt width (MBW), radius of curvature (RC), meander wavelength (ML), channel length (CL), channel depth (CD), and sinuosity (SI). Well logs and conventional core 'ground truth' the seismic data. A qualitative analysis of fluvial systems in the study intervals defines the fluvial styles and the lateral spacing between channels. Characterizing these fluvial systems demonstrates: (1) the controlling factors and processes that lead to their formation; (2) the reservoir heterogeneity within the Sable Sub-basin; (3) the relative times for deposition of each stratigraphic sequence; and (4) it provides a catalogue of geometries and dimensions for the fluvial channel bodies in the study area within an overall deltaic depositional setting.