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Please fill in your abstract title.	Integration of High-End Seismic Data with Outcrop Analogues Providing New Insights into the Sedimentary Systems of the Frontier Pegasus Basin, New Zealand

Please fill in your author name(s) and company affiliation.

Given Name	Surname	Company
Alex	Karvelas	Schlumberger
Adam	McArthur	University of Leeds
Bee Jik	Lim	Schlumberger
Bill	McCaffrey	University of Leeds

Abstract

Due to the lack of well control, high levels of uncertainty remain regarding the stratigraphy in the offshore portions of the frontier Pegasus Basin, offshore New Zealand. As a result, characterization of the outcropping syn-subduction strata was conducted to document lithofacies and map seismic-scale architectural elements. This, integrated with >15,500 km² of newly acquired 3D and >5000 km of 2D seismic data offshore, is providing a proxy calibration for sediments and stratigraphic architecture and, as a result, generating new insights into the highly prospective offshore basins.

Following the insightful 2D survey acquired in 2014, the Pegasus MC3D survey was acquired in 2016 to provide a regional coverage of high-resolution seismic data to allow detailed subsurface mapping. The latest acquisition technologies with high-end model building techniques (multiparameter common image point picking, pre-migration azimuth preservation, steering filters, and joint parameter updates) were implemented to derive a detailed tilted transversely isotropy model and migrated with 3D Kirchhoff prestack depth migration. As a result, better input data with a more accurate earth model and migration algorithms delivered a more accurate final image for interpretation and quantitative analysis in this region. With this high-end seismic volume and the new level of detail being imaged, subsurface interpretation was revised.

However, due to the lack of well control, high levels of uncertainty remain regarding the stratigraphy. As a result, characterization of the outcropping syn-subduction strata was conducted to document lithofacies and to map seismic-scale architectural elements. These include stacked lobe complexes up to 200 m thick within the center of sub-basins and fill of a canyon 5 km wide that connected the outcropping sub-basins. This gives insights into seismic-scale element distribution within the trench-slope sub-basins, their reservoir properties, and trap geometries. Additionally, this study investigates the timings and volumes of bypass phases in the outcropping sub-basins, which may lie on the same fairway as prospective offshore sub-basins.

Over 300 known onshore oil and gas seeps occur in the subduction wedge of eastern North Island, New Zealand, indicating at least one active petroleum system in the region. Despite historic production onshore, only two wells have been drilled offshore, making this complex tectonic region vastly underexplored. As those wells were drilled on structural highs in the near-shore region, little can be said regarding the type of sediments and their architecture in the prospective offshore sub-basins. This study objective is to reduce uncertainty in distribution of petroleum system elements in the prospective offshore portion of the basin. Through integrating this onshore study and the new insights gained through applying the latest acquisition and imaging technologies, we present a detailed description of the evolution of sub-basin structure and fill, in addition to the implications for down-stream sub-basins and petroleum systems.