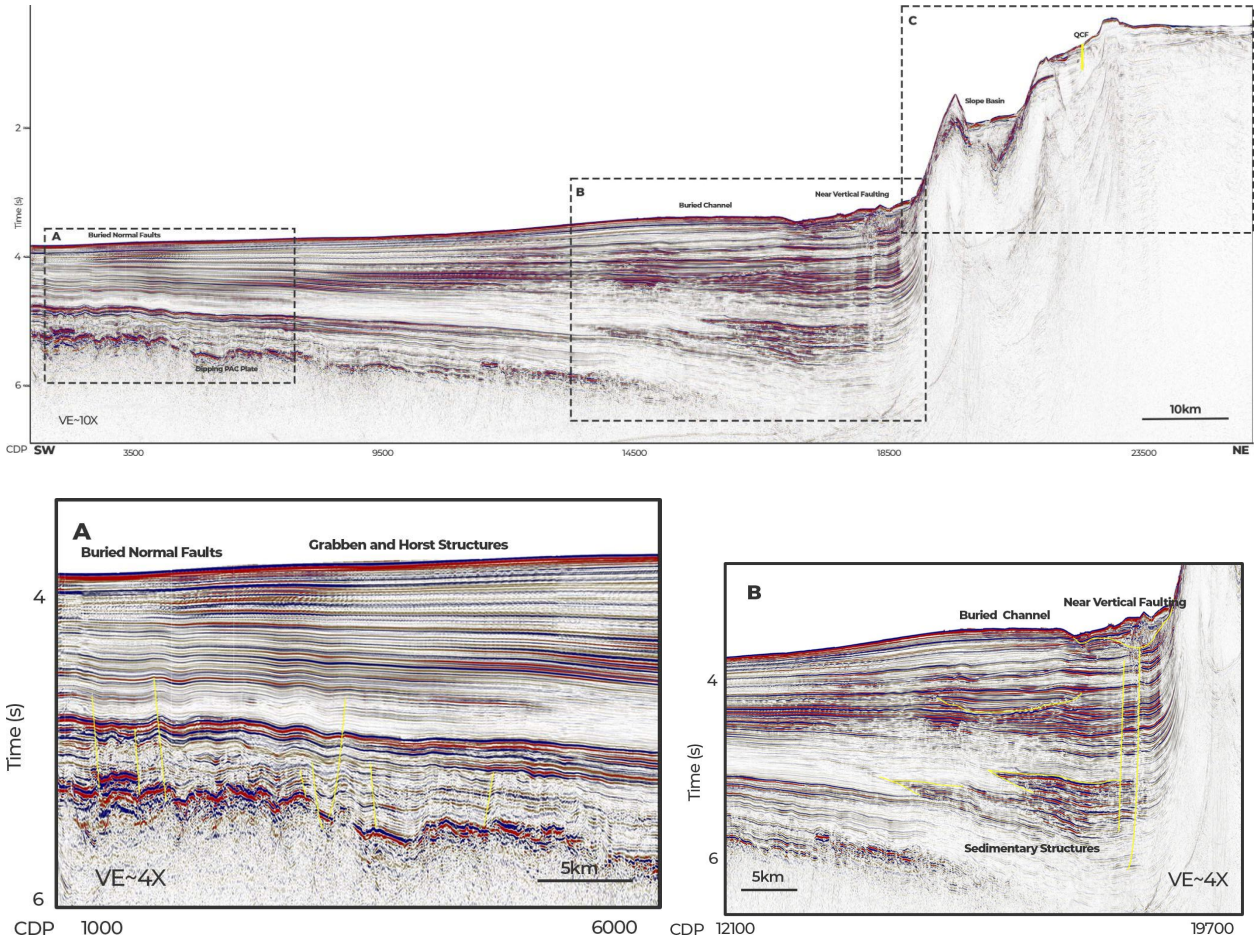
Strain partitioning and the accommodation of oblique convergence along the Queen Charlotte Fault

The Queen Charlotte Fault (QCF) forms a predominantly strike-slip plate boundary between the Pacific (PAC) and North American (NA) tectonic plates offshore western Canada and southeast Alaska. With a right-lateral displacement rate of >50 mm/year, deformation along the QCF is among the fastest of continental or continental-ocean transform systems globally. Along-margin changes in fault strike and degree of obliquity with respect to PAC-NA plate motion result in increasing convergence from north to south. The Transform Obliquity on the Queen Charlotte fault and Earthquake Study (TOQUES) project collected new multi-channel seismic (MCS) reflection data along a ~450 km section of the fault during the summer of 2021 aboard the R/V *Marcus G. Langseth*. Data were acquired using a 15-km-long streamer and a 6600 cubic inch tuned airgun array. Here, we focus on preliminary results from fault-crossing MCS profiles within the northern survey area, which is characterized by almost purely strike-slip PAC-NA plate motion. This area also hosted the 2013 Mw 7.5 Craig, Alaska earthquake. Energy from the Craig event propagated primarily northward, rupturing ~150 km along the fault. Aftershock sequences show events clustered at depths <25 km, both to the west of the main QCF fault trace and to the east. The aftershock locations indicate the presence of seismically active faulting within the PAC plate and potentially suggest that either the main QCF dips to the east or that there are active fault strands within the NA plate. We present new MCS profiles that cross the 2013 epicentral region to investigate fault zone architecture, crustal deformation mechanisms, and structural relationships at depth.



Seismic section from line QCF 12. The presence of structures and the main QCF trace is indicated in yellow. Deformational structures present are buried normal faults, a steeply dipping, and well deformed PAC to the SW. Near-vertical faulting, and a system of buried channels at the continental slope. Inset locations are indicated by dashed rectangles and labeled accordingly.