Characterizing the geometry of active splay faults at the Cascadia Subduction Zone

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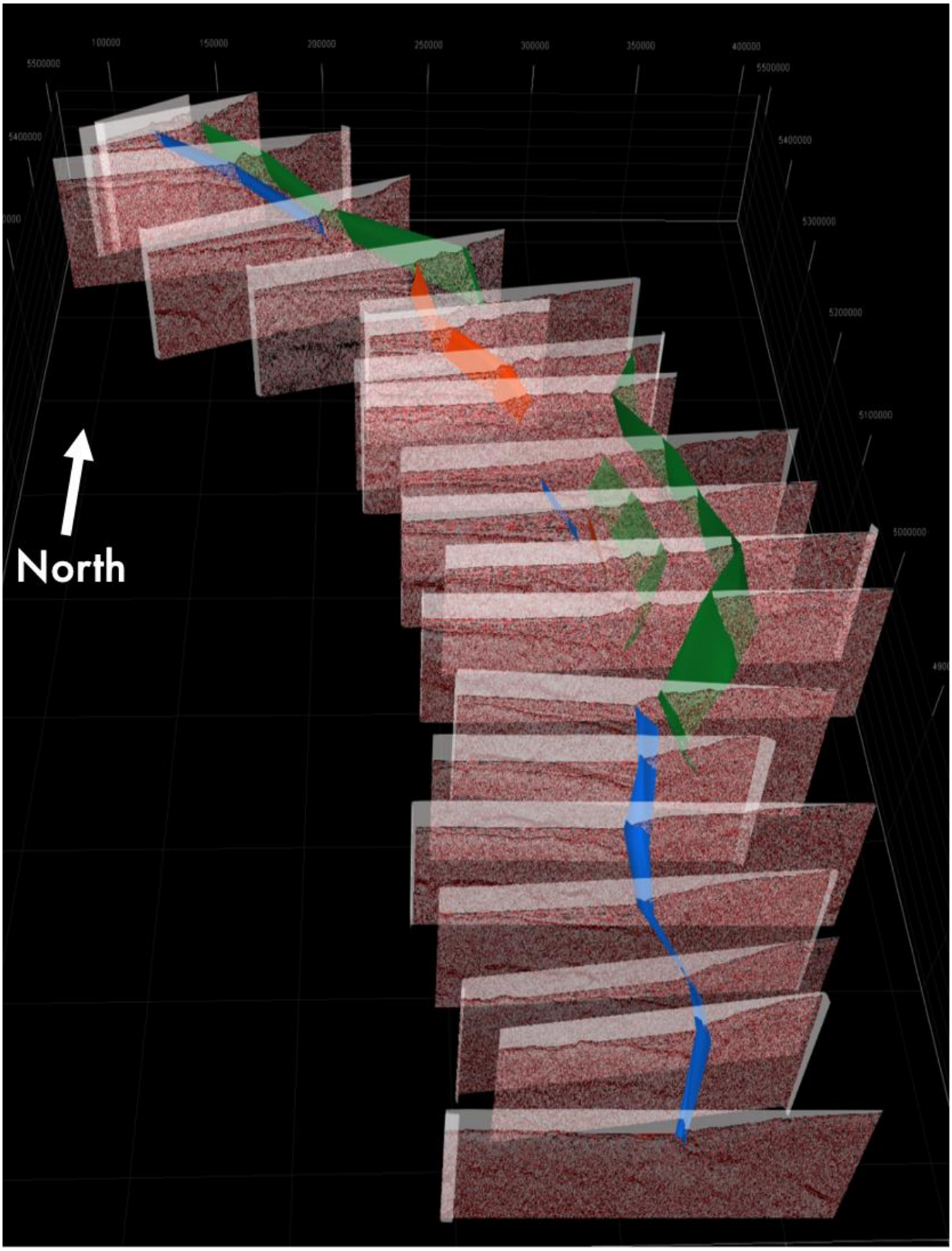
Slip on splay faults during megathrust earthquakes can significantly increase tsunami size and may have an effect on seismic shaking and landslides. Therefore, it is important to accurately characterize the geometry of active splay faults at subduction zones. Splay fault geometries are used as primary inputs in earthquake, tsunami, and plate locking modeling to estimate hazard at subduction zones. Past splay fault geometries used for modeling studies of the Cascadia Subduction Zone were oversimplified and unrealistic. Additionally, splay fault geometries are not easily accessible to modelers. We use depth-processed, marine multi-channel seismic reflection images from the CAscadia Seismic Imaging Experiment 2021 (CASIE21) to characterize the geometry of active splay faults in the accretionary wedge of the Cascadia Subduction Zone. We present three-dimensional splay fault geometries for frontal thrust and out-of-sequence splay faults with evidence of recent activity (see Figure). Splay fault geometries determined from this study will be incorporated into earthquake and tsunami simulations of the Cascadia Subduction Zone as part of the Cascadia Coastlines and Peoples (CoPes) Geohazards Research Hub in a broader effort to increase the resilience of coastal communities to Cascadia geohazards. In the future, we aim to create a database of active, three-dimensional splay faults geometries to contribute to a community faults model for the Cascadia Subduction Zone.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