UNREST WORKSHOP
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DYNAMIC RUPTURE MODELING OF THE NEWPORT INGLEWOOD FAULT: EXPLAINING COMPLEX RUPTURE PATHS

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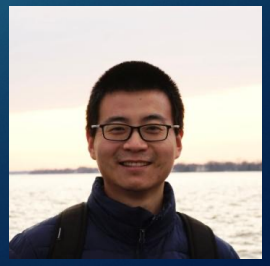
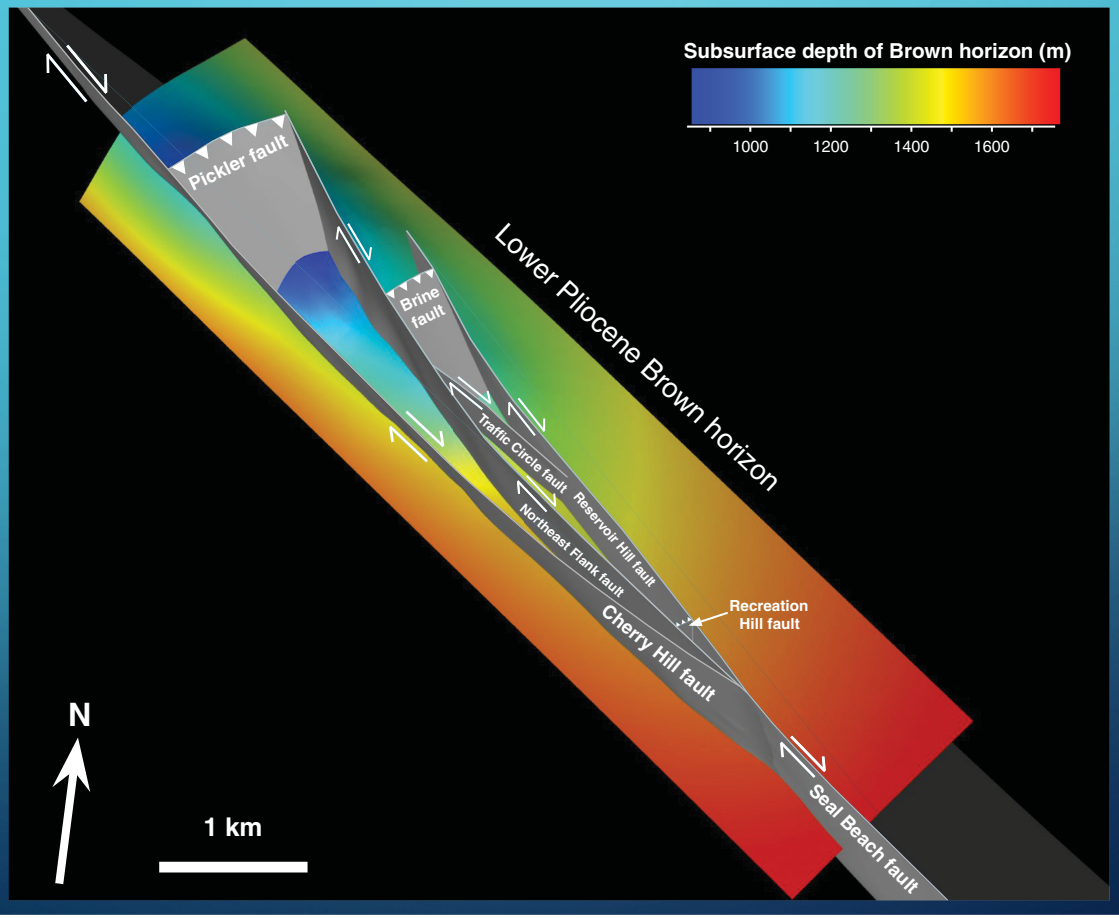


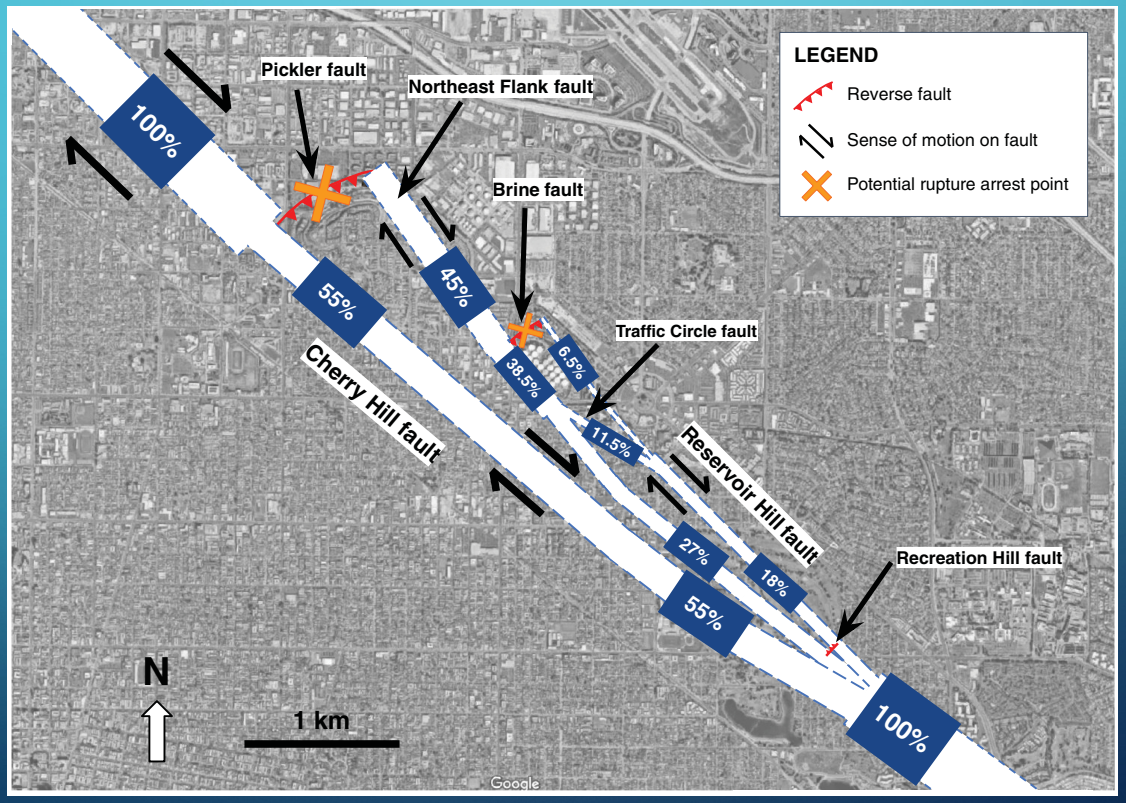
3D FAULT STRUCTURE IN SIGNAL HILL REGION NEWPORT-INGLEWOOD FAULT



[*Toghramadjian and Shaw*, 2024]

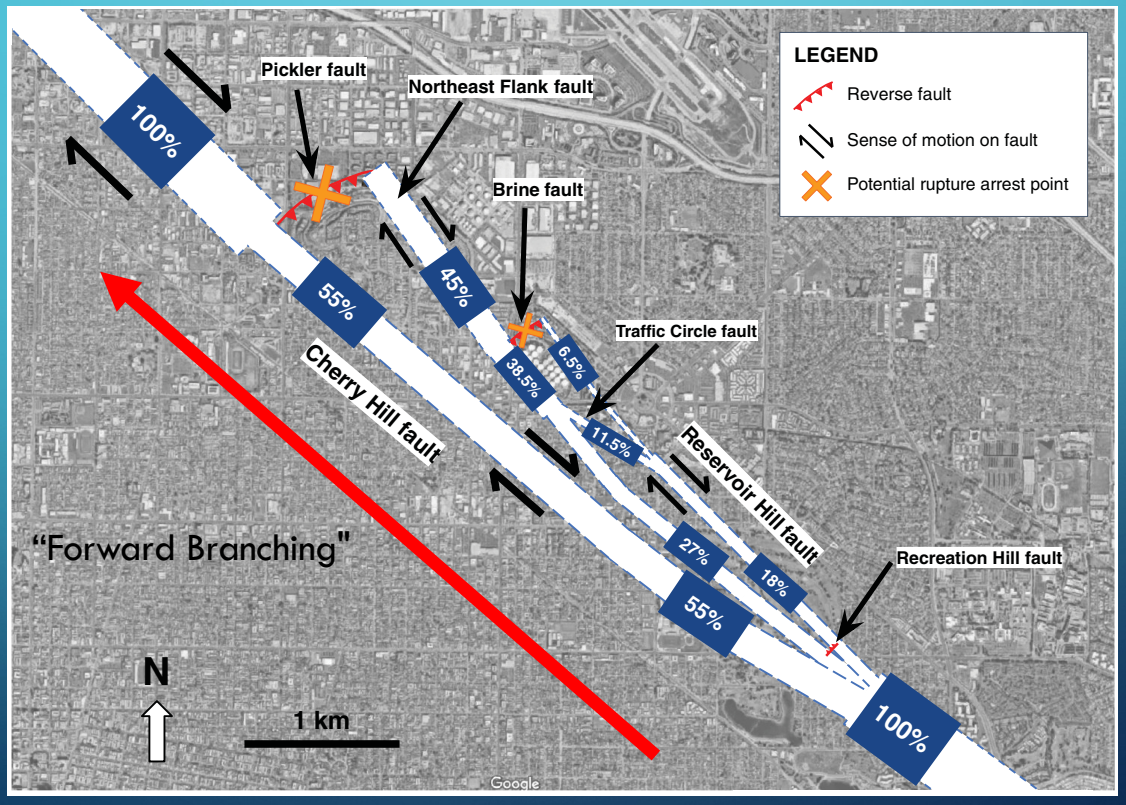
MULTIPLE RUPTURE PATHS AND CUMULATIVE FAULT SLIP INFERRED FROM SURFACE AND HORIZON DEFORMATION

"Specifically, we employ a map-based restoration approach that unfolds and unfaults horizons to define the total displacement across each fault segment"



[*Toghramadjian and Shaw*, 2024]

THEORETICAL BACKGROUND: FORWARD AND BACKWARD BRANCHING



[*Toghramadjian and Shaw*, 2024]

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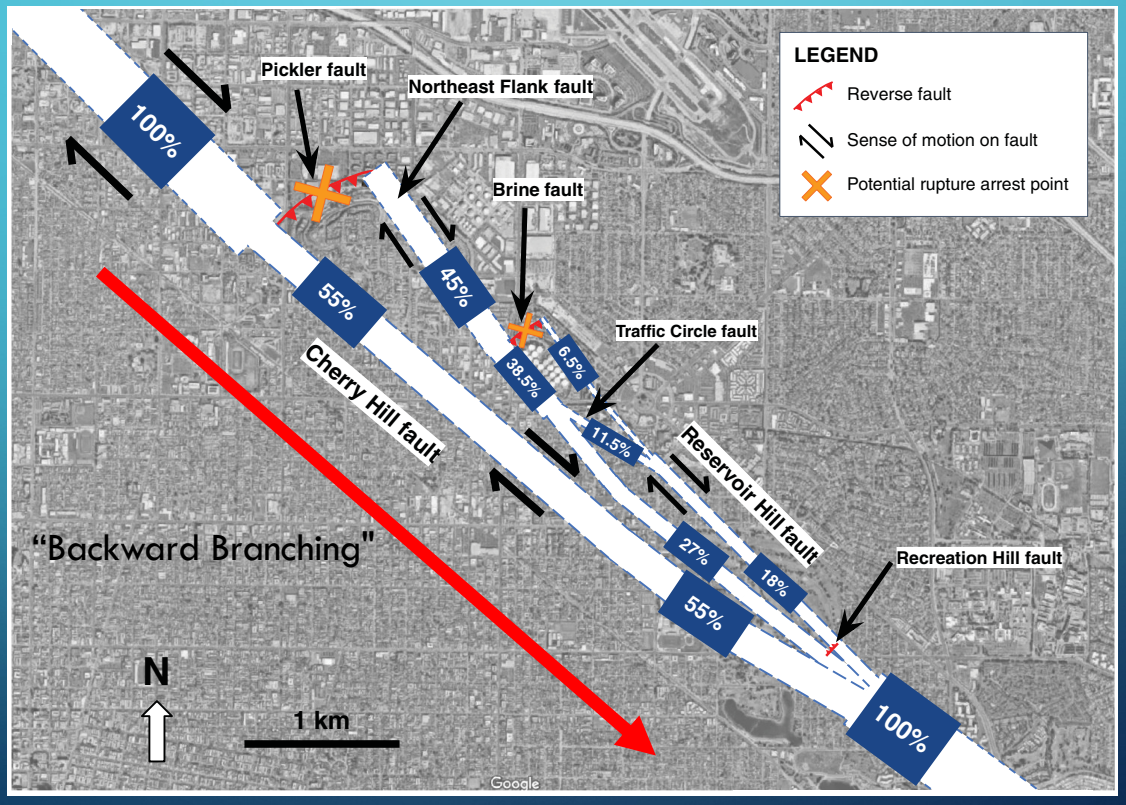
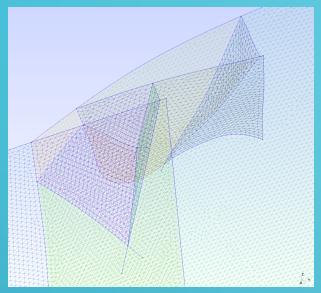
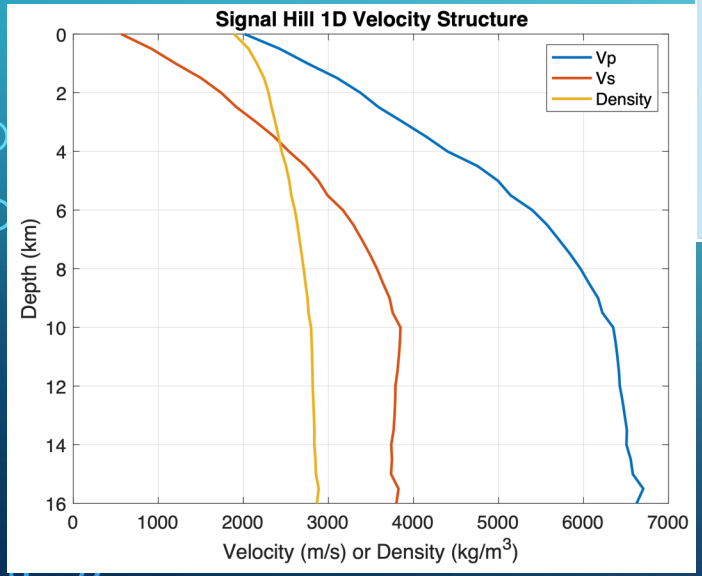


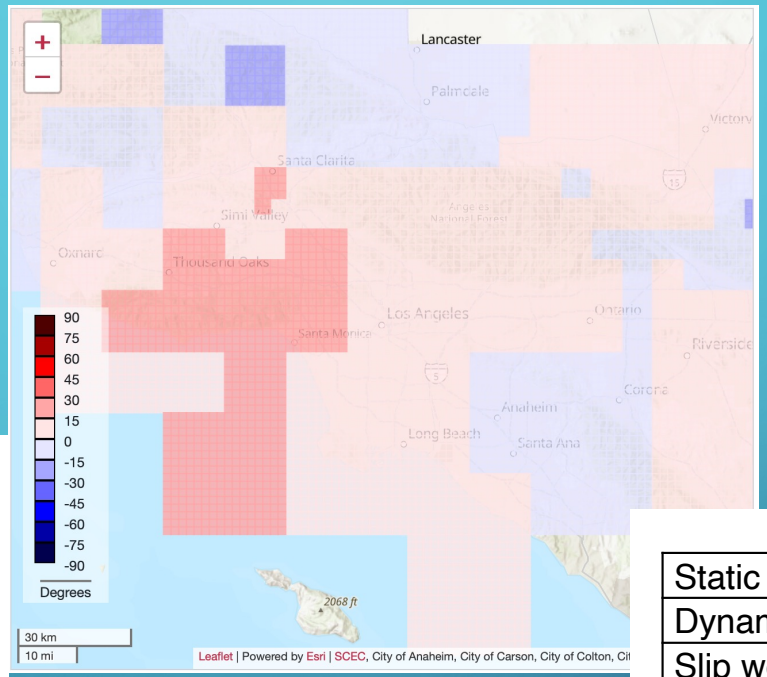
[*Toghramadjian and Shaw*, 2024]

DYNAMIC EARTHQUAKE RUPTURE MODELING WITH MIXED-FLUX-BASED NODAL DISCONTINUOUS GALERKIN METHOD (ZHANG ET AL., 2023)



Adapted from SCEC CVM-H [*Shaw et al.*, 2024]

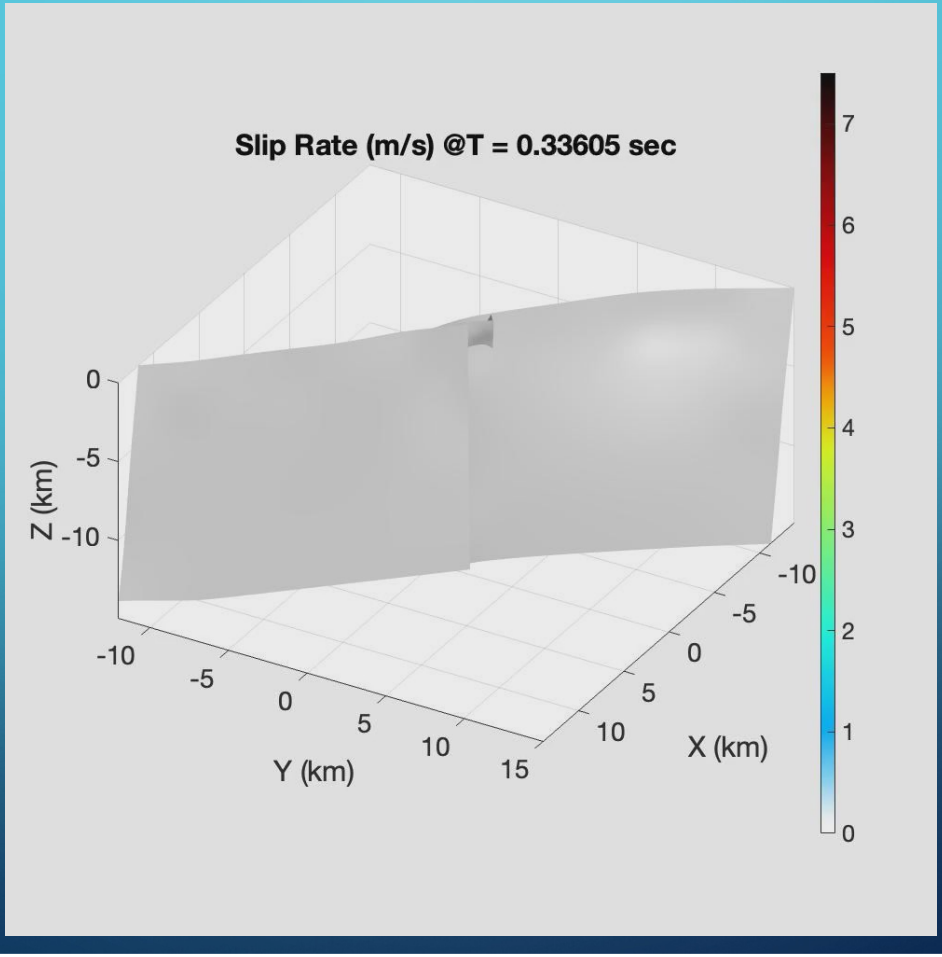




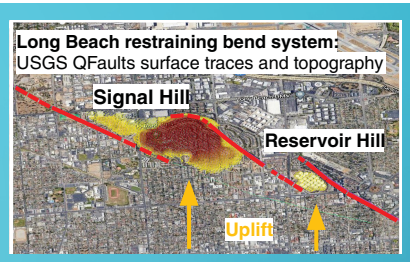
SCEC CSM [*Hardebeck et al.*, 2023]

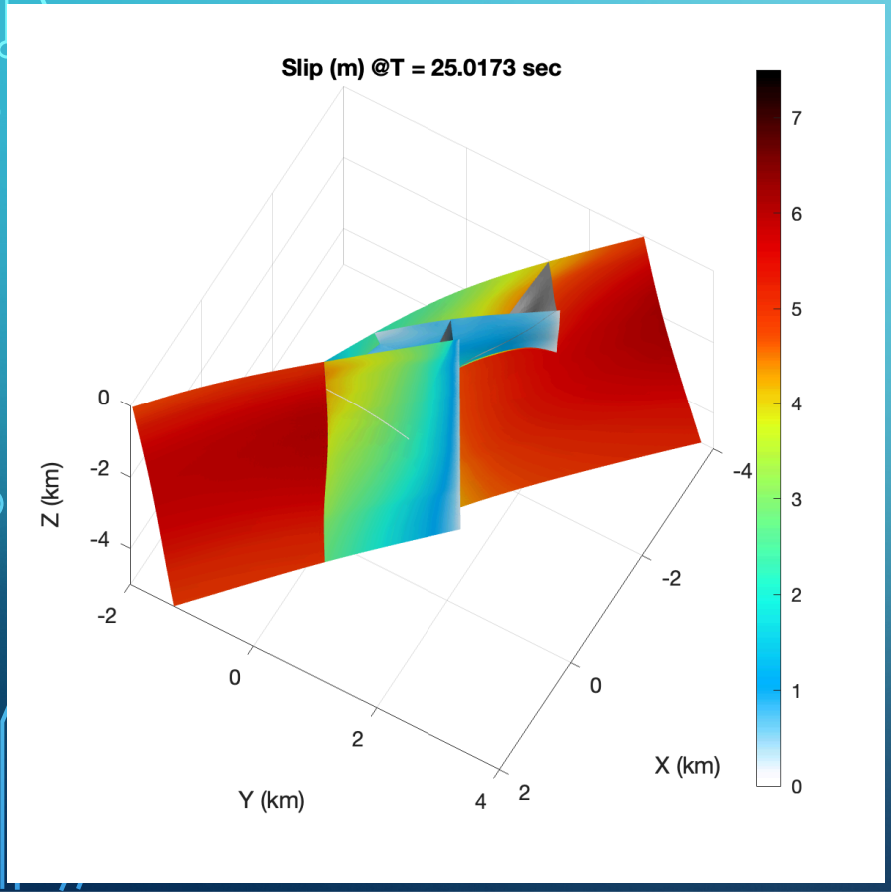
Static friction	0.6
Dynamic friction	0.1
Slip weakening	0.2 m
Homogeneous density	2670 kg/m^3
Homogeneous V_P	6000 m/s
Homogeneous V_S	3464 m/s
Mesh size on faults	~78 m
Expanded mesh near edge of model	~5000 m

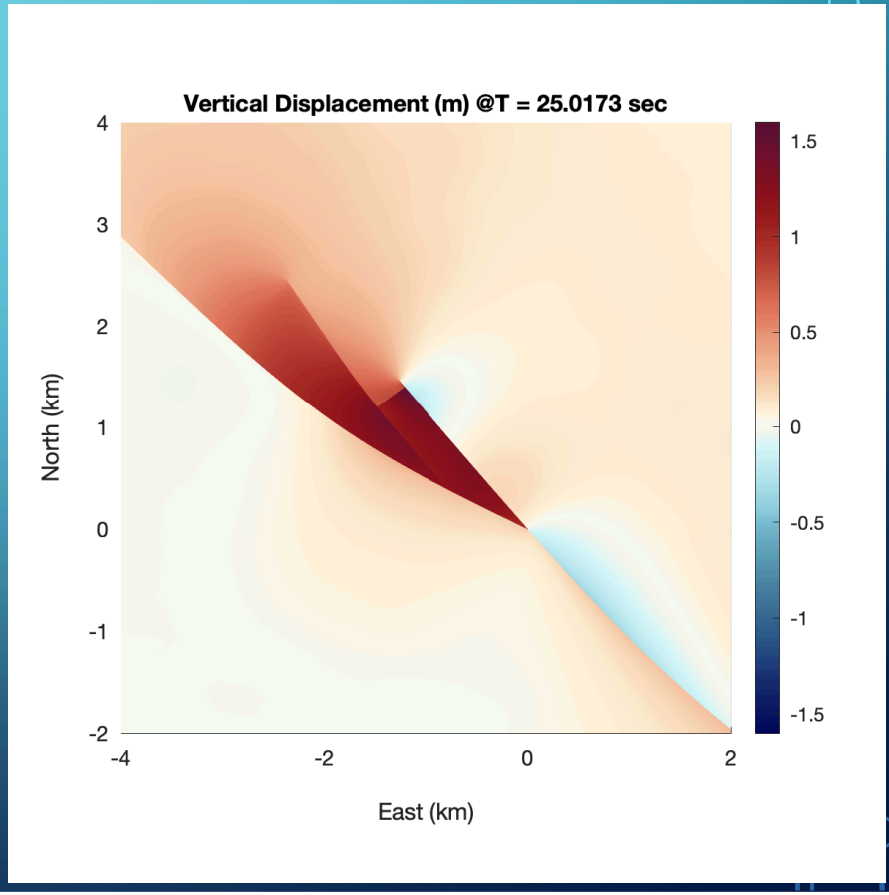
RESULTS: NUCLEATION SOUTHEAST OF BRANCH



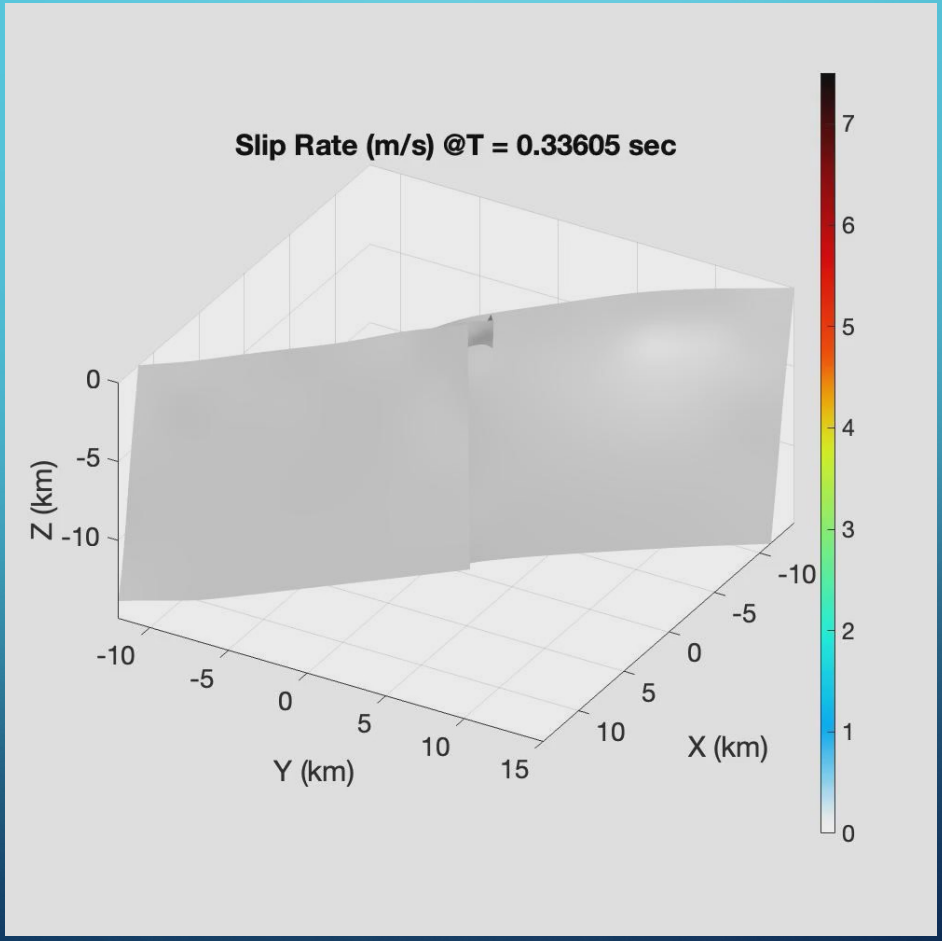
RESULTS: NUCLEATION SOUTHEAST OF BRANCH



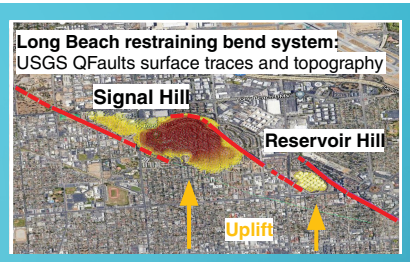


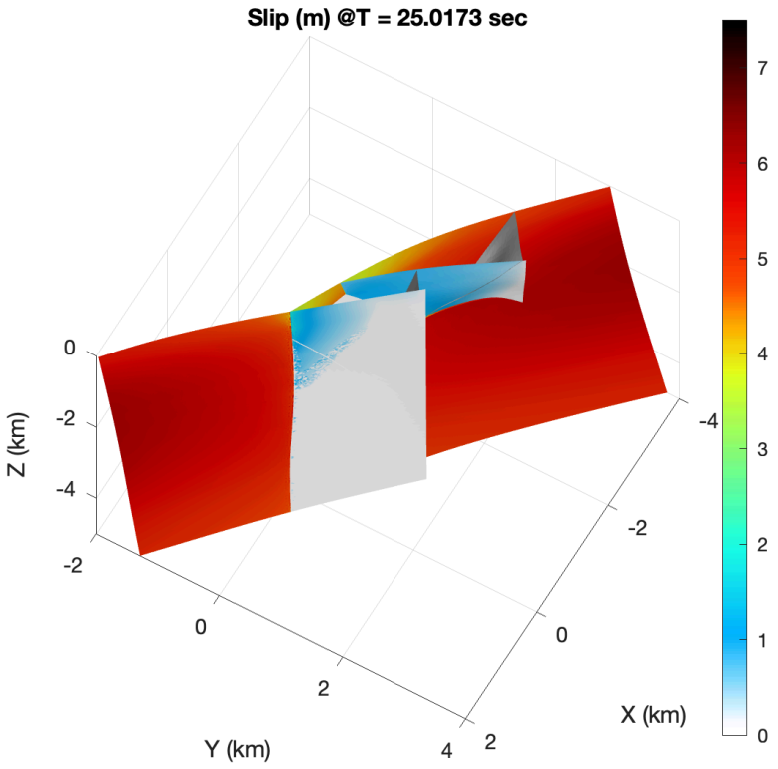


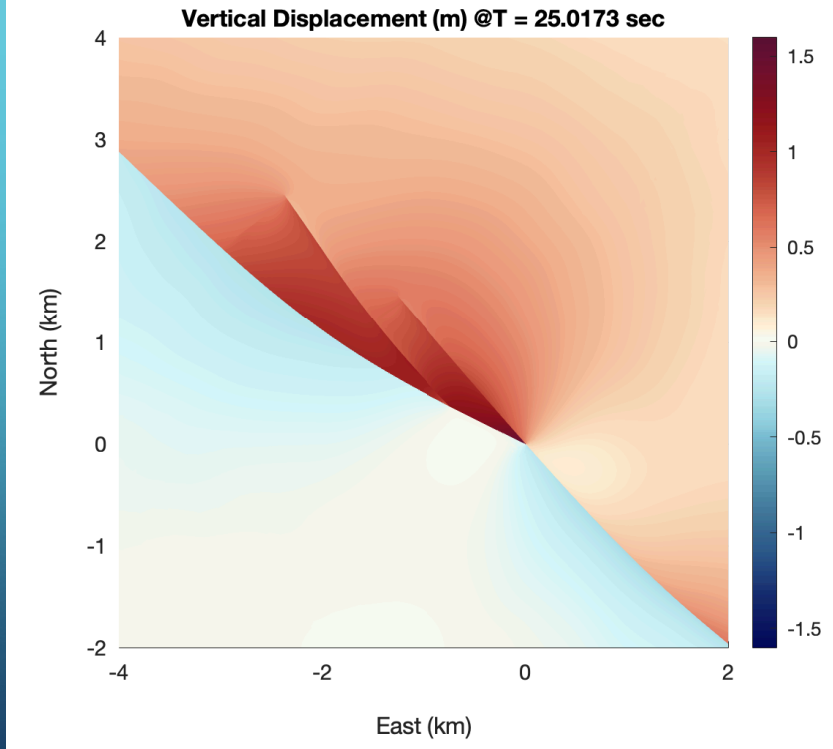
RESULTS: NUCLEATION NORTHWEST OF BRANCH



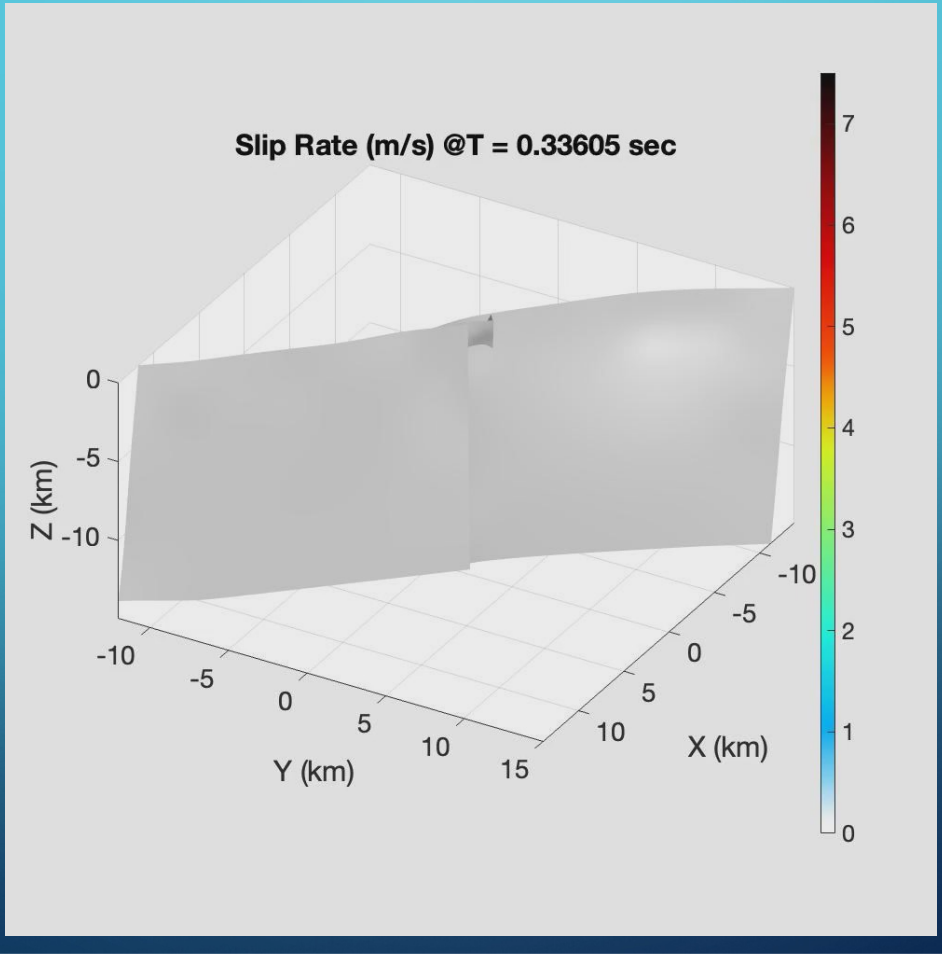
RESULTS: NUCLEATION NORTHWEST OF BRANCH







RESULTS: NUCLEATION SOUTHEAST OF BRANCH BRANCH FAULTS CONSTRAINED NOT TO SLIP



DISCUSSION

- Branching behavior much more complex when branches are surficial and approached from below
- Geological uplift may place constraints on rupture directivity
- Small, near-surface branches may may serve as earthquake gates
  - Approximate them away at our peril!