

Insights into the dynamics of subduction from studies in the Franciscan Complex

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Active subduction zones produce the world's largest earthquakes and generate tsunamis. These plate boundary fault systems are difficult to study in situ due to the depths at which they are active, which are mostly inaccessible to ocean drilling in the earthquake-generating (seismogenic) zone. Studying exhumed faults in ancient accretionary complexes offers a window into the controls on great earthquakes and the mechanisms of rock deformation during the interseismic periods. Of course, old rocks have history, and the history of coastal transverse motion during and after subduction, and the complex exhumation history, have produced complications for structural interpretation.

I'll present early results from three research projects in the Franciscan Complex, which combine field observations, classic petrology and microstructure, and some innovative new methods. First, sorting out the faults in the Marin Headlands to find the record of subduction earthquakes on imbricate thrusts; second, looking for the ancient plate boundary on Angel Island; and third, looking for a reference frame in which to organize the structural complexity in an eclogite/blueschist-greenschist block on Jenner Beach.

Biography: I am from Mill Valley, California. My first pet rock was an actinolite-talc schist, and I still have it. I was 11 when the M6.9 Loma Prieta Earthquake suddenly impressed on me that humans are small and temporary and thereby started me on the path to becoming a geologist. I was a mediocre student of great teachers at Smith College (AB 2000) and UC Santa Cruz (PhD 2007). I was a lecturer at University of Cape Town 2006-2009 and had a chance there to experiment (in research and teaching) and see lots of the world's greatest rocks. I left Cape Town to postdoc in a geophysics group at UCSC to learn everything I could about earthquakes and granular flow, but I mostly learned how to speak to earthquake seismologists. Since 2011 I have been a prof at McGill University, and the Wares Faculty Scholar in Economic Geology. I hold the Canada Research Chair in Earthquake Geology. In addition to earthquake geology and fault mapping, I work on the relationships between faults and ore deposits (especially gold), soft sediment deformation, X-ray diffraction, and rock mechanics. At McGill I teach an intro field methods course, field school, structural geology, and tectonics. For a more theoretical background on the geology of the earthquake cycle, I invite NCGS members to check out the Francis Birch Lecture I gave "at" the 2020 AGU meeting (<https://youtu.be/S8lijph56hk>).