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Title:
Deciphering the Fabric of Seismicity: Implications for Earthquake and Plate Tectonic Processes.

Abstract:
Seismic monitoring systems detect and locate tens of thousands of earthquakes every year, adding to an ever growing archive of instrumentally recorded seismic data that goes back almost a century. Most of the world's earthquakes occur along the boundaries of tectonic plates and represent the primary physical expression of plate tectonic processes. The location of earthquakes within the Earth's crust and mantle are the fundamental parameters used in a wide range of research areas, including earthquake physics, the structure and dynamics of the Earth's interior, and seismic hazards. Yet, the accuracy with which we know these locations is typically poor, and often unknown. Using advanced analysis techniques that harness both the vast amount of digital seismic data and increasing computing power, we can image seismicity at a much higher resolution and across larger regions than has previously been possible. In this talk I will describe recent developments in high-precision earthquake location techniques and their use towards real-time monitoring of seismogenic properties. I will present results from using these methods at both local to global scales to study the three-dimensional structure of active fault systems, the spatio-temporal evolution of seismicity, and the physical processes underlying seismic failure along major plate boundaries.