Plenary 3: Active tectonics and modern earth processes of North America (Fulton, Funning)

The third plenary session focused on active tectonics and modern earth processes of North America, and how EarthScope data could bring new insights to bear on these problems. An early highlight was the demonstration of relationships between modern seismicity in the central US and structures from ancient orogenies, synthesizing seismic imaging methods with multiple geologic and geophysical datasets. Data from a FlexArray deployment in the New Madrid Seismic Zone revealed significant anisotropy related to a pre-existing structure; a seismic lineament in eastern Tennessee was shown to correlate with a billion year-old fault zone dating to the assembly of the Rodinian supercontinent, identified by synthesizing seismic tomography results with geological and geophysical observations. We also saw how new innovations in processing and visualization of GPS data from the Plate Boundary Observatory (PBO) are revealing the signature of solid Earth flexure and flow from glacial isostatic adjustment, tectonic processes, and subsurface hydrologic changes.

We learned of the possibilities of using outreach not only to engage the public, but as a means of collecting meaningful data – in this case, campaign GPS data from the Pacific–North American plate boundary system in southern California, collected over the past decade by over 100 students and teachers from middle schools and high schools, and a similar number of undergraduate students. These data reveal in detail how crustal strain accumulation is distributed between the San Andreas and San Jacinto faults. Similarly, focused seismic studies in the region around the San Andreas Fault Observatory at Depth (SAFOD) and the Cascadia subduction zone are illuminating the nature of repeating earthquake sequences and low-frequency earthquakes and are allowing for rigorous investigation into key source parameters such as stress drop and event duration, and how these scale with event size. These geophysical results integrate well with new insights into the strength and deformation processes of the San Andreas arising from laboratory experiments at a range of slip velocities on fault zone material obtained from SAFOD drilling. Together the multidisciplinary aspects of EarthScope science were highly evident, as was the contribution to significant advancements in our understanding of tectonic and surface processes and fault mechanics.