S41A-03 Preliminary Correlation of Earthquakes with Seismogenic Faults, Central Oklahoma

Back to: Vincent Cronin

Thursday, May 07, 2015 08:30 AM - 08:45 AM
Palais des congrès de Montréal • 511A

Seismicity in Oklahoma has increased in frequency and magnitude since 2008. Most events in Oklahoma have occurred where no active faults have been recognized. The purpose of this work is to spatially correlate earthquakes along a trend in central Oklahoma with the fault that generated them, and to evaluate whether or where the seismogenic fault reaches the ground surface.
The Seismo-Lineament Analysis Method (SLAM) uses data from earthquake hypocenter locations and focal mechanisms, geomorphology, and fieldwork to spatially correlate an earthquake with the ground-surface trace of the fault that generated the earthquake. We project each nodal plane (NP) from the hypocenter to the ground surface as represented by a digital elevation model, plus or minus uncertainties in hypocenter location and NP orientation. The resulting uncertainty swath on the ground surface, called a seismo-lineament, is where we might expect to find the trace of the seismogenic fault if (1) the NP coincides with the fault, (2) the fault is emergent and (3) the fault is approximately planar.
Epicenters for 321 M≥2 events near Oklahoma City form a linear array that trends ~38°, sub-parallel to the mean strike of one NP from each of 7 M≥4 events in the array. That NP is inferred to be the fault plane solution for a given event. We created a hillshade map and illumined it at low elevation angle perpendicular to the strike of the fault plane solutions. Geomorphic lineaments were noted within and along the seismo-lineaments, and these will be the focus of field investigations in the coming months.
We use borehole breakout data to indicate the orientation of strain axes in the sedimentary cover, and compare the results with axial orientations derived from GPS velocities at the ground surface. The orientation of strain axes derived from moment tensors might be controlled by the orientation of reactivated pre-Cenozoic(?) faults in the crystalline basement rather than by the current crustal strain field.

Previously Published

Yes - The details of SLAM have been presented, and some preliminary results of this study will have been presented at a GSA sectional meeting in Oklahoma in March. Our presentation in May will include new results.

Authors

Brandon Rasaka
Baylor University

Vincent Cronin
Baylor University

View Related Events

Session Proposal: General Contributions in Seismology I Technical Advances and Developments

Joint Assembly Program Committee: Seismology

Day: Thursday, May 07, 2015