Induced Earthquakes in the 21st Century

Dr. Greg Beroza

Earthquakes triggered by human activities have been documented for over half a century, but the past decade has seen a resurgence of induced earthquakes associated with energy resources. In 2006, an M3.4 earthquake occurred during geothermal energy development in Basel, Switzerland, causing the project to be abandoned. In 2009, concerns about triggered earthquakes in the Geysers, California contributed to the early termination of an experimental exploitation effort. New technologies allow hydrocarbons to be recovered from low permeability rocks; however, injection of water produced from that process has the potential to trigger earthquakes. Plans to reduce greenhouse gas in the atmosphere by deep CO2 injection would require such massive injection volumes that it may set off earthquakes. In all of these ways, induced seismicity is a problem that impacts future energy options, so it is important to understand it. The phenomenon of induced earthquakes also raises interesting questions. How can we tell induced earthquakes from naturally occurring, tectonic earthquakes? How can we predict where they are likely to occur? How can we mitigate the risk associated with induced earthquakes? How should induced earthquakes be treated in existing policy – from quantifying seismic hazard to mitigating the consequences of earthquakes? In this talk I will review recent instances of induced seismicity, and summarize the state of the science seeking to answer these questions.

Biography

Dr. Greg Beroza is the Wayne Loel Professor of Earth, Energy, and Environmental Sciences at Stanford University, where he has been on the faculty since 1990. He holds a BS degree from UC Santa Cruz and a Ph.D. degree from MIT. He has been Co-Director, in charge of science planning, for the Southern California Earthquake Center since 2007, and Co-Director of the Stanford Center for Induced and Triggered Seismicity since 2013. His research focus is on earthquake seismology. Of particular relevance to induced and triggered earthquakes are his work on earthquake detection, high precision earthquake location, and earthquake ground motion prediction. He is an AGU Fellow, President of the Seismology Section of the AGU, and the 2014 Gutenberg Medalist of the EGU for outstanding contributions to seismology.