

# Environmental Effects and the Geomechanics of Australian Earthquakes

Mark Quigley<sup>1</sup>

*1. Associate Professor of Earthquake Science, School of Geography, Earth, and Atmospheric Sciences, University of Melbourne, Australia*

## Abstract

In the last 50 years, Australian earthquakes have ruptured the ground surface with an approximate return period of 5 years. Discrete and distributed surface deformation features produced in earthquakes may be hazardous to critical infrastructure (e.g., dams, pipelines, energy schemes) and thus analyses of active faults may enhance risk mitigation strategies for site determination and engineering design. High-resolution digital and field mapping of historical and prehistoric (neotectonic) fault ruptures, shallow excavations, geophysical imaging and modelling, and statistical techniques collectively provide important insights into the physical and temporal characteristics of Australian earthquakes. Fundamental characteristics of ground surface ruptures, including rupture complexity and slip distributions, are highly modulated by crustal geophysical structure. This talk will present new evidence for ground surface rupturing  $M_w > 6.5$  earthquakes on the Willunga Fault near Adelaide over the last ca. 100 kyr. The potential of active fault studies to enhance forecasting of future ground surface displacements, across different return periods and geological domains, will be illustrated using newly developed scaling relationships, historical and paleoseismic data, and probabilistic fault displacement hazard analyses.

**Keywords:** earthquake environmental effects, geomechanics, Australia.