ARMA Future Leader Webinar Series

Every Two Weeks on Fridays 9-10 AM MT

From dots in space to space-time-magnitude connections: what can energy release interevent connections tell us about stress and fracture?

Dr. Jesse Hampton, University of Wisconsin-Madison

Friday February 23, 2024, 9-10 AM MT

https://westernuniversity.zoom.us/j/99355457319

Abstract

Current understanding of using energy releases for both fields of experimental damage mechanics or induced seismicity primarily focuses on parametric analysis, e.g., individual traits of energy releases such as magnitude and rate of release. But the extensive information embedded in the organizational patterns of energy releases has hardly been explored. Here we study the specific organizational signatures that they possess. A key theme to this work is to show that energy release organizational signatures (topology) are physically connected to fundamental mechanisms of fracture and slip—but demands a perspective shift to an interdisciplinary approach that combines mechanics and data science. We move from understanding energy releases in time only, to connecting them in space-time-magnitude-mechanism and understanding the shape of these multi-dimensional networks as tree structures and their evolution. This presentation will demonstrate the analyses that extend single scale acoustic emission (AE) data into multi-scale connected networks that can inform our understanding of stress evolution.

Biography

Jesse Hampton is an Assistant Professor in Civil and Geological Engineering (Department of Civil and Environmental Engineering) at the University of Wisconsin-Madison. At the intersection of humanity, Earth systems, and the infrastructure needed for travel and power generation, there exists an interdisciplinary field where civil engineering, geological engineering, sustainability, geophysics, and data science are inextricably linked. At this intersection, Dr. Hampton's research focuses on a few cross-cutting themes including multiscale damage (e.g., from microcracks to earthquakes), nondestructive evaluation (NDE) techniques (e.g., from acoustic emissions (AEs) to distributed fiber optic sensing), and artificial intelligence (e.g., from optimization to

deep learning). The goal of Dr. Hampton's research is to predict and mitigate damage in Earth and Civil Engineering systems from the micro- to field-scales to enhance infrastructure sustainability. Prior to joining the UW-Madison faculty, Dr. Hampton worked in geomechanics and geophysics research for both Halliburton and New England Research. He obtained his PhD in 2015 from Colorado School of Mines. Google Scholar: https://scholar.google.com/citations?user=mbTGfxsAAAAJ&hl=en. Research Group Website: https://geod.wisc.edu/