Rachel E. Abercrombie

Employer: Boston University
Boston, Massachusetts
USA

Employment:

2006 –	Research Associate Professor, Boston University
2014 – 2020	LOA Faculty, Univerity of Nevada, Reno (part time)
2004 – 2005	Associate Professor, Boston University (with Tenure)
2001 – 2003	Assistant Professor, Boston University
1998 – 2001	Research Associate, Harvard University
1995 – 1998	Scientist, Institute of Geological and Nuclear Sciences, Wellington, New Zealand
1994 – 1995	Associate Research Scientist, University of Southern California
1991 – 1994	Research Associate, University of Southern California
1993 – 1994	Four Month Post-doctoral Fellowship at University of Nevada, Reno
July-Sept 1991	Technical Assistant at Fina Exploration Plc., Epsom, U. K.
1987-1990	Research and Teaching Assistant, Reading University

Education:

1987 - 1991 Ph.D. University of Reading and British Geological Survey, Edinburgh, Great Britain
1984 - 1987 B.A. Trinity Hall, Cambridge University, Great Britain (MA Cantab. 1988)

Research Experience:

My research is focused on understanding earthquakes, a complex problem that also has real relevance to society. I am interested in all aspects of the earthquake rupture process. For example, how earthquakes start and grow, what factors govern the size and location of slip, how one earthquake affects another. In particular my work has focused on whether earthquake stress release (which is needed for dynamic modeling) and consequent shaking depend on the earthquake magnitude, depth and local strain rate. To understand the relative importance of different factors on the outcome of a laboratory experiment, a researcher would repeat the experiment under varying conditions. As an observational seismologist studying a natural phenomenon this is not possible, so instead I study earthquakes over a wide range of magnitudes from distinct tectonic environments; relating any observed similarities and differences to the different conditions should highlight the most important factors. I am also using the relatively controlled environment of induced seismicity to understand the triggering of tectonic earthquakes.

Measurements of earthquake source parameters are difficult, and often poorly constrained, especially for the more numerous smaller events; the lack of agreement between results from different researchers using different data and approaches is severely hampering our progress. One major focus of my research has therefore become improving our observational methods and quantification of uncertainties. To progress we need to identify the causes of the variability, including the effects of source complexity, and this has motivated me to lead collaborative work, and an ongoing community study to improve source parameter measurements, and then use them to improve our understanding of earthquake physics and ground motions.

I continue to work with various colleagues and students to apply ever-improving methods consistently to obtain useful measurements of earthquake sources from different tectonic settings. These include natural and induced seismicity, and also low frequency earthquakes at subduction zones, and intermediate depth events. I then combine these source parameter measurements with constraints on stress orientation, fault geometry, and spatial and temporary seismicity migration, to probe the driving forces and improve our understanding of temporally varying earthquake risk.

Another long term research interest is perhaps the least well-understood plate boundaries: oceanic transform faults. My work on oceanic strike-slip earthquake sources, in particular depth, and slip extent has a long term aim of understanding the similarities and differences between slip on oceanic transforms and their more dangerous, continental counterparts to determine the factors governing the motion of each.

Publications:

Abercrombie, R. E., Trugman, D. T., Shearer, P. M., Chen, X., Zhang, J., Pennington, C. N., Hardebeck, J. L., Goebel, T. H., & Ruhl, C. J., 2021. Does earthquake stress drop increase with depth? *Journal of Geophysical Research: Solid Earth,* 126, e2021JB022314. https://doi.org/10.1029/2021JB022314

Abercrombie, R. E., X. Chen & J. Zhang, 2020. Repeating earthquakes with remarkably repeatable ruptures on the San Andreas Fault at Parkfield, *Geophysical Research Letters, 47, e2020GL089820. https://doi.org/10.1029/2020GL089820*

Ruhl, C. J., R. E. Abercrombie, K. D. Smith, and I. Zaliapin, 2016. Complex Spatiotemporal Evolution of the 2008 M_w 4.9 Mogul Earthquake Swarm (Reno, Nevada): Interplay of Fluid and Faulting, *J. Geophys. Res., Solid Earth*, 121, doi:10.1002/2016JB013399.

Aderhold, K., R. E. Abercrombie, 2016. The 2015 M7.1 Earthquake on the Charlie-Gibbs Transform Fault: Repeating Earthquakes and Multi-modal Slip on a Slow Oceanic Transform, *Geophys. Res. Lett*., doi: 10.1002/2016GL068802.

Abercrombie, R. E. and Rice, J. R., 2005, Can observations of earthquake scaling constrain slip weakening?, *Geophys. J. Int., 162*, 406-424.

Felzer, K. R., R. E. Abercrombie, and G. Ekström, 2004, A common origin for aftershocks, foreshocks, and multiplets, *Bull. Seism. Soc. Am., 94,* 88-99.

Abercrombie, R. E. and Ekström, G., 2001, Earthquake slip on oceanic transform faults, *Nature, 410*, 74-77.

Abercrombie, R. E. and Mori, J., 1996, Occurrence patterns of foreshocks to large earthquakes in the western United States, *Nature, 381*, 303-307.

Abercrombie, R. E., 1995, Earthquake source scaling relationships from -1 to 5 M_L, using seismograms recorded at 2.5 km depth, *J. Geophys. Res., 100*, 24015-24036.

Honors:

Fellow, American Geophysical Union, 2020.

Professional Societies:

- Member of the American Geophysical Union
- Member of the Seismological Society of America