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Correlation between acoustic emission and mechanoluminescence of rock cores under quasistatic compression[1] RACHEL A. MILLER, TIMOTHY W. DARLING, Physics, University of Nevada, Reno — When a rigid solid undergoes mechanical deformation, locally accumulated strain energy can be released through multiple avenues including acoustic emission (AE) and light emission known as mechanoluminescence (ML). In AE, events within a stressed rock such as defect movement, grain boundary shifting, and crack propagation create pressure waves which can be detected at the rock surface. While AE is used extensively for rock evaluation in geophysics, civil engineering, and mining, ML by comparison has received little attention from the geoscience community. ML from stressed and fracturing rock has been observed in mines, earthquakes, and the laboratory, but the underlying mechanism behind ML is poorly understood. Possible candidates include defect movement, creation of charged surfaces during fracture, piezoelectrification, and triboluminescence. Observing whether a correlation exists between ML and AE will help determine the source of ML. We have designed an apparatus for AE and ML detection of rock cores under quasistatic compression. Using photomultiplier tubes and piezoelectric transducers, AE and ML events can be spatially and temporally observed and correlated. We present apparatus design and preliminary results.

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