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The Testability of $M_{\max}$ Estimates

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Recent disasters caused by earthquakes of unexpectedly large magnitude (such as those of Tohoku and Christchurch) illustrate the need for reliable estimates of the maximum possible magnitude, $M_{\max}$, at a given fault or in a particular zone. Such estimates are essential parameters in seismic hazard assessment, but their accuracy remains untested. In fact, the testability, or lack thereof, of $M_{\max}$ estimates, even over short time periods, is still uncertain. In this study, we discuss the testability of long-term and short-term $M_{\max}$ estimates and the limitations that arise from testing such rare events. Of considerable importance is whether or not those limitations imply a lack of testability of a useful maximum magnitude estimate, and whether this should have any influence on current hazard assessment methodology.