How Did Scientists Make This Forecast?

California sits on the boundary between two of the Earth’s major tectonic plates—the Pacific and North American Plates—which move inexorably past each other at a rate of about 2 inches per year. Much of this motion is accommodated from time to time by sudden slip on faults, producing earthquakes. Although the San Andreas Fault is the main locus of slip, hundreds, if not thousands, of other faults splay out from the plate boundary, spreading the threat of large earthquake ruptures through most of the State.

The new Uniform California Earthquake Rupture Forecast (UCERF) combines information from geodesy (precise data on the slow relative movement of the Earth’s tectonic plates), geology (mapped locations of faults and documented offsets on them), seismology (occurrence patterns of past earthquakes), and paleoseismology (data from trenches across faults documenting the dates and offsets of past earthquakes they contain). The first three kinds of data are shown here as layers in the diagram. All four kinds of data are combined mathematically to produce the final probability values for future ruptures in the California area, in regions of the State, and on individual faults.

Building on several previous studies and decades of data collection, UCERF was developed by a multidisciplinary group of scientists and engineers, known as the 2007 Working Group on California Earthquake Probabilities. Advice and comment was sought regularly from the broader community of earthquake scientists and engineers through open meetings and workshops. Where experts disagreed on aspects of the forecast, alternative options were accounted for in calculations to reflect these uncertainties. The final forecast is a sophisticated integration of scientific fact and expert opinion.