# Numerical Seismicity Prediction with STAN

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## Abstract

Thc Stress Transfer and Nucleation (STAN) project has produced several interesting and unexpected scientific results. The most important one of these is probably an observational test of failure time re-mapping, which should be published in BSSA during 2002 or 2003. Aftershock modelers have previously suggested that aftershocks may be re-mapped background seismicity, moved forward in time by the mainshock, but observational tests of this theory have not been available. The STAN project has found that the decay of compound aftershock sequences is sensitive to re-mapping. Models of the influence of the Landers mainshock on the decay of Hector Mine aftershocks support the theory, but the theory doesn't actually improve predictions of Hector aftershock counts when STAN is run as a forecast model. The contradiction between these two results is probably less severe than it seems at first, because STAN predictions seem to favor the simplest model in almost all cases. The penalty for extra parameters in the model is much greater than one would predict using conventional statistical techniques. This suggests that there are instabilities or inaccuracies in these data and models which have not yet been understood. The approximate nature of current stress transfer models is one source of inaccuracy, and another is the earthquake nucleation process. STAN models should develop considerable skill when these defects are corrected. The interim results suggest that the successful model of earthquake nucleation will involve a failure process that accelerates toward failure, such that failure time re-mapping is the generative process behind aftershock sequences.