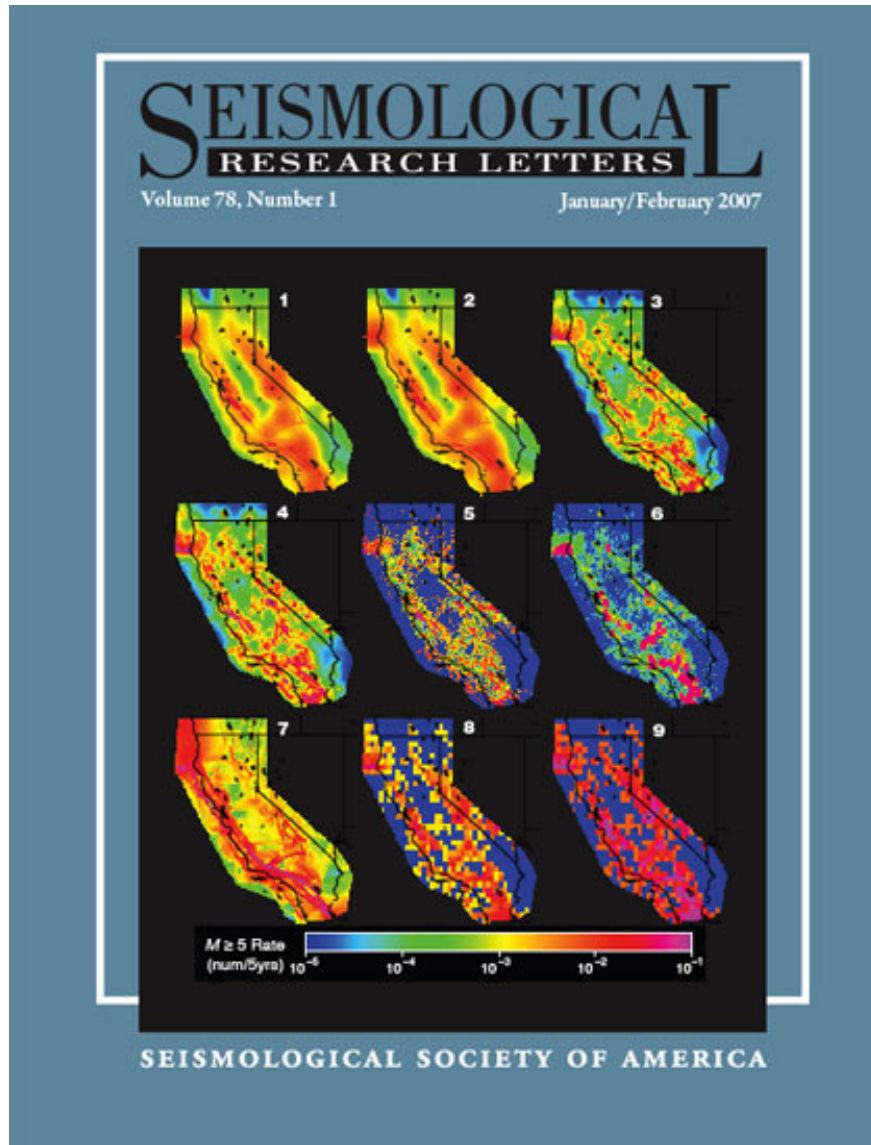


Regional Earthquake Likelihood Models (RELM)



(15 papers)

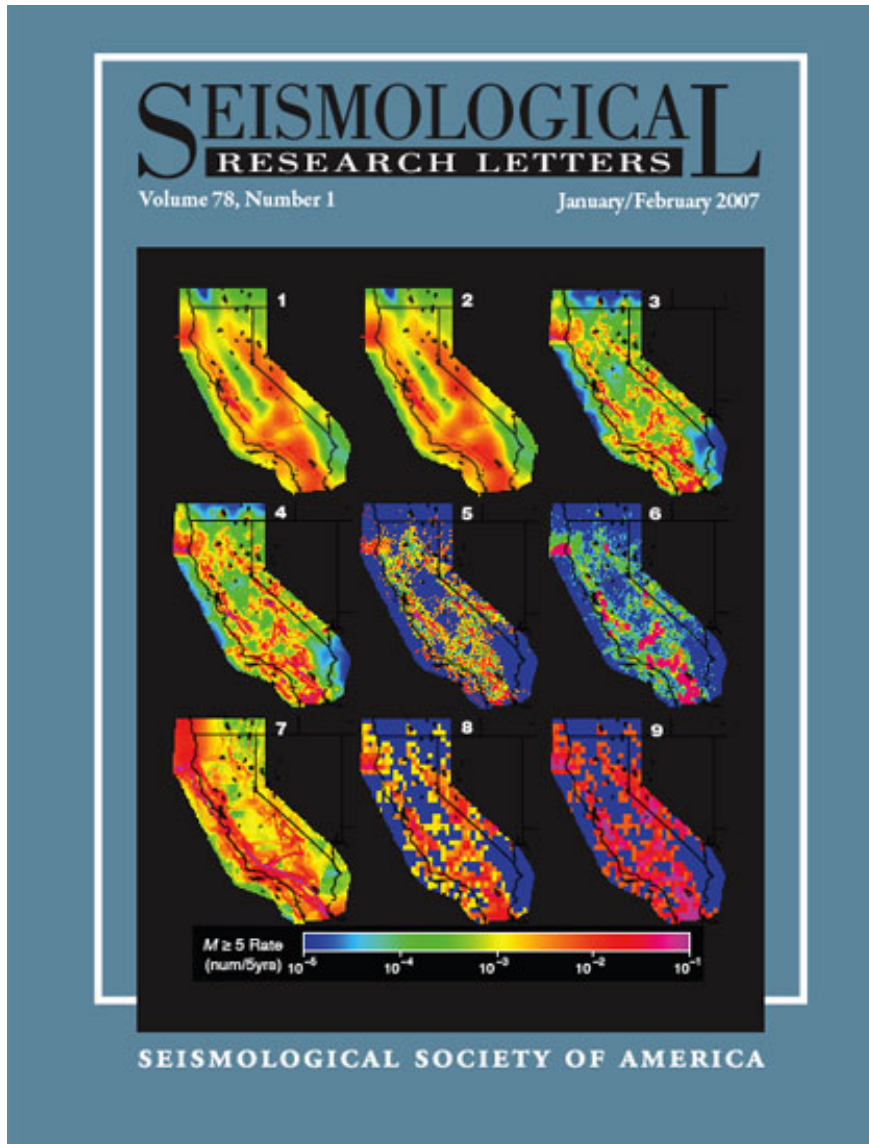
ARTICLES

Overview of the Working Group for the Development of Regional Earthquake Likelihood Models (RELM) [GSW EXTRACT] [FULL TEXT LINK FOR SSA MEMBERS] Edward H. Field	7
Earthquake Likelihood Model Testing [GSW EXTRACT] [FULL TEXT LINK FOR SSA MEMBERS] D. Schorlemmer, M. C. Gerstenberger, S. Wiemer, D. D. Jackson, and D. A. Rhoades	17
RELM Testing Center [GSW EXTRACT] [FULL TEXT LINK FOR SSA MEMBERS] D. Schorlemmer and M. C. Gerstenberger	30
Seismic Hazard Inferred from Tectonics: California [GSW EXTRACT] [FULL TEXT LINK FOR SSA MEMBERS] Peter Bird and Zhen Liu	37
Real Time Forecasts through an Earthquake Clustering Model Constrained by the Rate-and-State Constitutive Law: Comparison with a Purely Stochastic ETAS Model [GSW EXTRACT] [FULL TEXT LINK FOR SSA MEMBERS] Rodolfo Console, Maura Murru, Flaminia Catali, and Giuseppe Falcone	49
Non-Poissonian Earthquake Clustering and the Hidden Markov Model as Bases for Earthquake Forecasting in California [GSW EXTRACT] [FULL TEXT LINK FOR SSA MEMBERS] John E. Ebel, Daniel W. Chambers, Alan L. Kafka, and Jenny A. Baglivo	57
Short-term Aftershock Probabilities: Case Studies in California [GSW EXTRACT] [FULL TEXT LINK FOR SSA MEMBERS] M. C. Gerstenberger, L. M. Jones, and S. Wiemer	66
High-resolution Time-independent Grid-based Forecast for $M \geq 5$ Earthquakes in California [GSW EXTRACT] [FULL TEXT LINK FOR SSA MEMBERS] Agnès Helmstetter, Yan Y. Kagan, and David D. Jackson	78
A RELM Earthquake Forecast Based on Pattern Informatics [GSW EXTRACT] [FULL TEXT LINK FOR SSA MEMBERS] James R. Holliday, Chien-chih Chen, Kristy F. Tiampo, John B. Rundle, Donald L. Turcotte, and Andrea Donnellan	87
A Testable Five-Year Forecast of Moderate and Large Earthquakes in Southern California Based on Smoothed Seismicity [GSW EXTRACT] [FULL TEXT LINK FOR SSA MEMBERS] Yan Y. Kagan, David D. Jackson, and Yufang Rong	94
Time-independent and Time-dependent Seismic Hazard Assessment for the State of California: Uniform California Earthquake Rupture Forecast Model 1.0 [GSW EXTRACT] [FULL TEXT LINK FOR SSA MEMBERS] Mark D. Petersen, Tianqing Cao, Kenneth W. Campbell, and Arthur D. Frankel	99
Application of the EEPAS Model to Forecasting Earthquakes of Moderate Magnitude in Southern California [GSW EXTRACT] [FULL TEXT LINK FOR SSA MEMBERS] David A. Rhoades	110
Implications of Geodetic Strain Rate for Future Earthquakes, with a Five- Year Forecast of $M5$ Earthquakes in Southern California [GSW EXTRACT] [FULL TEXT LINK FOR SSA MEMBERS] Zheng-Kang Shen, David D. Jackson, and Yan Y. Kagan	116
Methods for Evaluating Earthquake Potential and Likelihood in and around California [GSW EXTRACT] [FULL TEXT LINK FOR SSA MEMBERS] Steven N. Ward	121
ALM: An Asperity-based Likelihood Model for California [GSW EXTRACT] [FULL TEXT LINK FOR SSA MEMBERS] Stefan Wiemer and Danijel Schorlemmer	134

Regional Earthquake Likelihood Models (RELM)

Goals

- Since there is no consensus, let developers build whatever models they see fit (multiple models are needed to represent epistemic uncertainties anyway)
- Test these models prospectively (Schorlemmer, Gerstenberger, Wiemer, Jackson, & Rhoades)
- Evaluate Hazard Implications (users can't wait for validation)



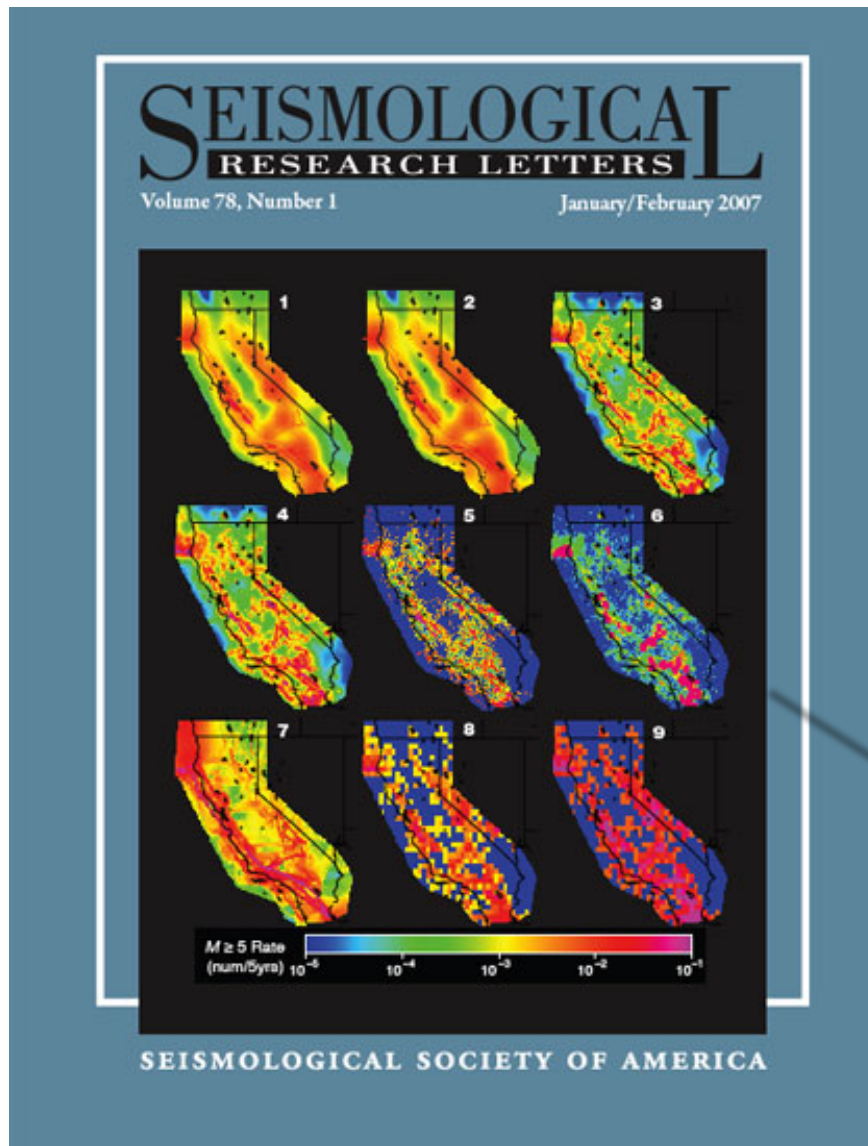
Regional Earthquake Likelihood Models (RELM)

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- Since there is no consensus, let developers build whatever models they see fit (multiple models are needed to represent epistemic uncertainties anyway)
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As hypocenter forecasts, most RELM models are not usable in SHA (additional layers of assumptions are required; point process → non point process)

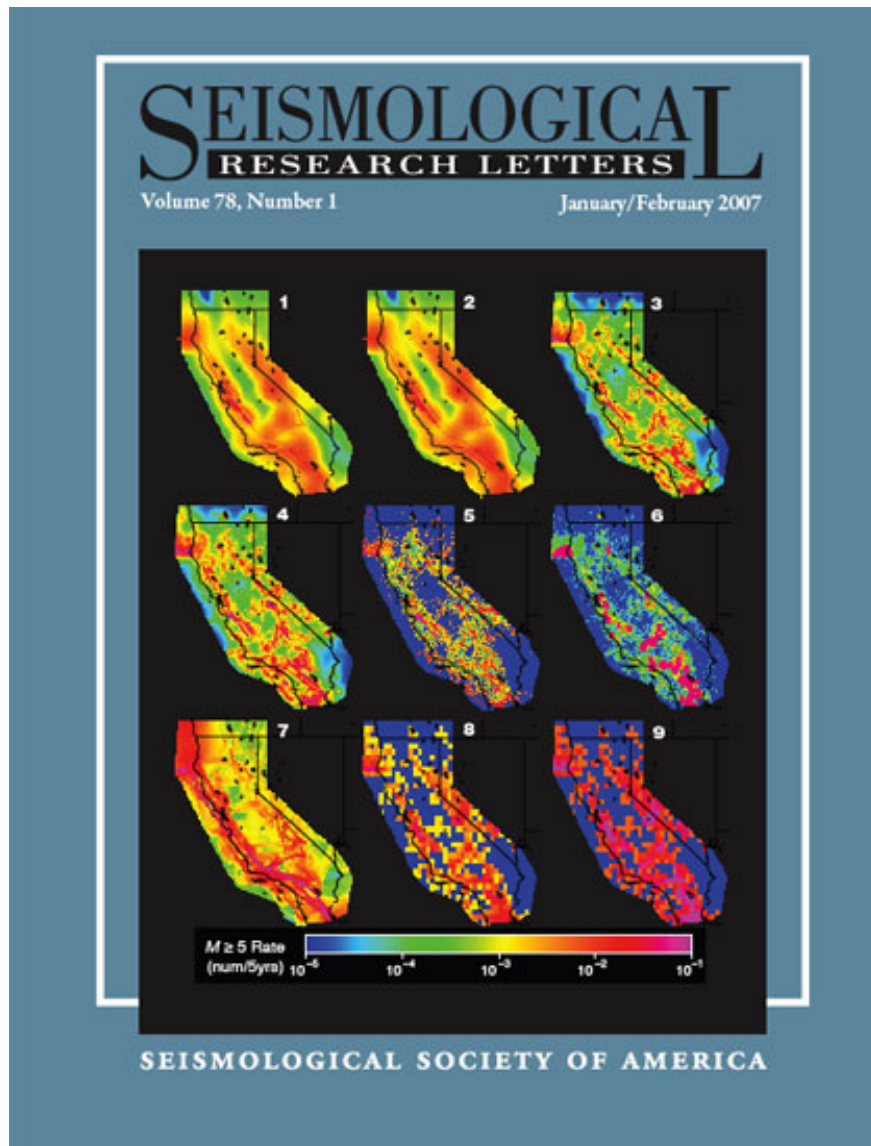
Development of “official” models transitioned to the Working Group on California Earthquake Probabilities (WGCEP)



Regional Earthquake Likelihood Models (RELM)

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Questions for CSEP (from the WGCEP/NSHMP perspective)

How long will we have to wait to get useful results (as a function of magnitude (e.g., $M \geq 6$) and region size)?

How do we handle the fact that the lifespan of a typical model is less than the time needed to test it?

What about: “All models are wrong; some are useful”?

e.g.

UCERF2 was invalidated by El Mayor Cucapah, plus it lacks Denali-like earthquakes and spatiotemporal clustering.

However, it's still the most useful model available for CA.

Questions for CSEP (from the WGCEP/NSHMP perspective)

How long will we have to wait to get useful results (as a function of magnitude (e.g., $M \geq 6$) and region size)?

How do we handle the fact that the lifespan of a typical model is less than the time needed to test it?

What about: “All models are wrong; some are useful”?

Have we learned anything actionable so far?

Most useable thing I’ve seen is still controversial:

Other ways of testing models are bearing more fruit?

nature geoscience LETTERS *by models*

SSA 2012 Talk: Aftershock Statistics Constitute the Strongest Evidence for Elastic Relaxation in Large Earthquakes

Adaptive (Helmsteter)

rate jumped. In contrast, where the aftershock zone of the first earthquake fell under the stress shadow of the second and static stress dropped, seismicity shut down. The arrest of seismicity implies that static stress is a requisite element of spatial clustering of large earthquakes and should be a constituent of hazard assessment.

inversely proportional to time, resulting in a net gain in seismicity for times less than about 5 yr (b). Here we set the rate/stress function parameter multiplied by the normal stress, A_0 , to 0.4 bar, and aftershock duration, t_0 , to 10 yr, values appropriate for the Joshua Tree and Landers earthquakes. At times greater than t_0 , the net seismicity rate becomes slightly negative.

Questions for CSEP (from the WGCEP/NSHMP perspective)

How long will we have to wait to get useful results (as a function of magnitude (e.g., $M \geq 6$) and region size)?

How do we handle the fact that the lifespan of a typical model is less than the time needed to test it?

What about: “All models are wrong; some are useful”?

Have we learned anything actionable so far?

Since there is no single or best test, how do we prevent cherry picking the test?

How are epistemic uncertainties handled (e.g., UCERF2 is really 480 different models)?

Are simulation-based models (e.g., UCERF3) handled properly (e.g., do they have to be converted to an average rate map)?