Geophysical Research Abstracts
Vol. 14, EGU2012-11791-2, 2012
EGU General Assembly 2012

Combining earthquake forecast models using differential probability gains

P. Shebalin (1,2), C. Narteau (2), J. Zechar (3), and M. Holschneider (4)

(1) International Institute of Earthquake Prediction Theory and Mathematical Geophysics, Moscow, 84/32 Profsouznaya, Moscow 117997, Russia., (2) Institut de Physique du Globe de Paris, Sorbonne Paris Cité, Univ Paris Diderot, UMR 7154 CNRS, 1 rue Jussieu, 75238 Paris, Cedex 05, France., (3) Institut f. Geophysik, NO H 61 Sonneggstrasse 5 8092 Zürich, Switzerland., (4) Institute of Dynamics of Complex Systems (DYCOS), Universitat Potsdam, POB 601553, 14115 Potsdam, Germany.

We propose a method to combine earthquake forecast models. The general procedure is to successively create new generations of a rate-based model by injecting into the current generation the additional knowledge carried by other input models. For a single iteration, we use the differential probability gain calculated in the Molchan diagram that evaluates the performance of the input model with respect to the current generation of the rate-based model. Then, at each point in space and time, the new rate is the product of the current rate times the local differential probability gain. The main advantage of our combining method is to produce high expected event rates using all types of numerical forecast models. The only restriction is that the input model has to bring additional amount of information with respect to the current generation of the alarm-based model. Here, we apply this method to EAST and EEPAS, two forecast models currently tested in the California testing center of the Collaboratory for the Study of Earthquake Predictability (CSEP). During the testing period from July 2009 to December 2011, the combined model shows better performance than the input model (EAST) and the initial rate-based model (EEPAS), both in terms of Molchan diagrams and likelihood tests. We show that a large number of events occurs in a limited space of higher forecasted rates. Most importantly, these rates are significantly higher than a linear combination of the two forecast models.