Comprehensive and topical evaluations of earthquake forecasts in number, time, space and magnitude

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Among evaluation scores of prediction performance, the log-likelihood is the most natural and important. We will use this score naively to compare performances of probability forecasts. Estimation error of the log-likelihood value is given for the uncertainty of the score. Although the log-likelihood score evaluates a comprehensive power of forecasts, we further need to evaluate topical predictive powers of respective components of number of earthquakes; namely, occurrence time, space, magnitude. For these purpose, we will use conditional or marginal likelihood function based on the observed events. Such topical scores reveal strong and weak parts of a forecasting model, and suggest which components of the model should be improved. We will illustrate the use of these scores to evaluate probability forecasts for CSEP Japan experiments during the period 1 - 31 March 2011, in which the Tohoku-Oki earthquake of magnitude 9.0 is included.

Keywords: One-day probability forecast, log likelihood score, CSEP