Short-term retrospective forecasting of earthquakes based on temporal variations of the b-value of the magnitude-frequency distribution

Paolo Gasperini¹, Emanuele Biondini¹, Antonio Petruccelli², Barbara Lolli³, and Gianfranco Vannucci³

¹Università di Bologna, Dipartimento di Fisica e Astronomia, Bologna, Italy (paolo.gasperini@unibo.it)
²Swiss Seismological Service (SED) ETH Zürich
³Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Bologna

In some recent works it has been hypothesized that the slope (b-value) of the magnitude-frequency distribution of earthquakes may be related to the differential stress inside the crust. In particular, it has been observed that low b-values are associated with high stress values and therefore with high probability of occurrence of strong seismic shocks. In this paper we formulate a predictive hypothesis based on temporal variations of the b-value. We tested and optimized such hypothesis retrospectively based on the homogenized Italian instrumental seismic catalog (HORUS) from 1995 to 2018. A comparison is also made with a similar predictive hypothesis based on the occurrence of strong foreshocks.