



Identification of temporal patterns in the Sumatra rupture zone using Poisson Hidden Markov models

K. Orfanogiannaki (1), D. Karlis (2), G.A. Papadopoulos (1)

1. National Observatory of Athens, Institute of Geodynamics, Athens, Greece, (2)
University of Economics, Department of Statistics, Athens, Greece
(kOrfanogiannaki@freemail.gr)

On 26 December 2004 and 28 March 2005 occurred two of the largest earthquakes of the last 40 years between the Indo-Australian and the southeastern Eurasian plates with moment magnitudes $M_w=9.1$ and $M_w=8.6$ respectively. Poisson Hidden Markov models (PHMM) are used for identifying temporal patterns in the time series of the two mainshocks. Each time series consists of daily counts of earthquakes in the regions determined by the aftershock zones of the two mainshocks. In PHMM each observation is generated by one of m Poisson processes, that are called states. These states are not visible to an external observer, but only the outcome, hence the name PHMM. The random mechanism that chooses which state generates each observation is, in fact, a Markov chain. The state/phase in which an area is at a given period depends on the one in the previous period, through the transition probability matrix of the Markov chain. The unobserved sequences of states that underlie the time series of the two mainshocks are estimated using PHMM and similarities between them are investigated. Additionally, arguments that with some probability we expect an increase or a decrease of seismic activity in the epicentral regions of the two mainshocks for a large time frame are extracted.