



Was the magnitude ($M = 9.0R$) of the mega-earthquake of Japan (11th of March, 2011) predictable? An analysis based on the Lithospheric Seismic Energy Flow Model (LSEFM)

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The Tohoku EQ (11th of March, 2011, $M = 9.0$) in Japan falsified the proposed EQ magnitude range ($M = 7.0 - 8.5$) of the same seismogenic regional area that had been determined by the compiled hazard maps, study of historical data, or other probabilistic methods while a larger magnitude ($M > 9.0$) had been proposed for all subduction zones. The observed discrepancy between the proposed EQ magnitude range and the actual one of the Tohoku EQ is studied in this work in terms of the cumulative seismic energy release of the study area and by the use of the Lithospheric Seismic Energy Flow Model (LSEFM). The results indicate that the Tohoku mega-earthquake magnitude could be predicted quite accurately provided that a long past seismic history had been available for use by the LSEFM procedure. Moreover, the presence, of the missing historic 1855 EQ ($7.0 < M < 8.0$) from seismic catalogs, was predicted backwards by the LSEFM method and its existence was verified by the Ishibashi (2004) work on Japanese historic seismicity. The recurrence time of the Tohoku EQ is estimated as being at least as 100 years. It is proposed frequent monitoring of the Japanese area seismic potential by compiling regularly in time the corresponding seismic potential maps.

Key words: Tohoku earthquake, earthquake magnitude, lithosphere, cumulative seismic energy, mega-earthquakes, seismic potential maps.

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