Supplementary Materials

Revisiting Vrancea (Romania) intermediate-depth seismicity: some statistical characteristics and seismic quiescence testing

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In the following pages please find the Supplementary Figures referred in our paper.

References cited in the Figures S1 and S3 (the references are listed below with the same numbers as in the Reference list of the main paper):

59. Utsu, T. On seismicity, in *Report of the Joint Research Institute for Statistical Mathematics, Inst. for Stat. Math* **1992**., Tokyo, 139–157.

27. Marmureanu, A.; Ionescu, C.; Grecu, B.; Toma-Danila, D.; Tiganescu, A.; Neagoe, C.; Toader, V.; Craifaleanu, I.-G.; Dragomir, C.S.; Meita, V.; Liashchuk, O.I.; Dimitrova, L.; Ilies, I. From national to transnational seismic monitoring products and services in the Republic of Bulgaria, Republic of Moldova, Romania, and Ukraine. *Seismol. Res. Lett.* **2021**, 92(3), 1685–1703, doi:10.1785/0220200393.

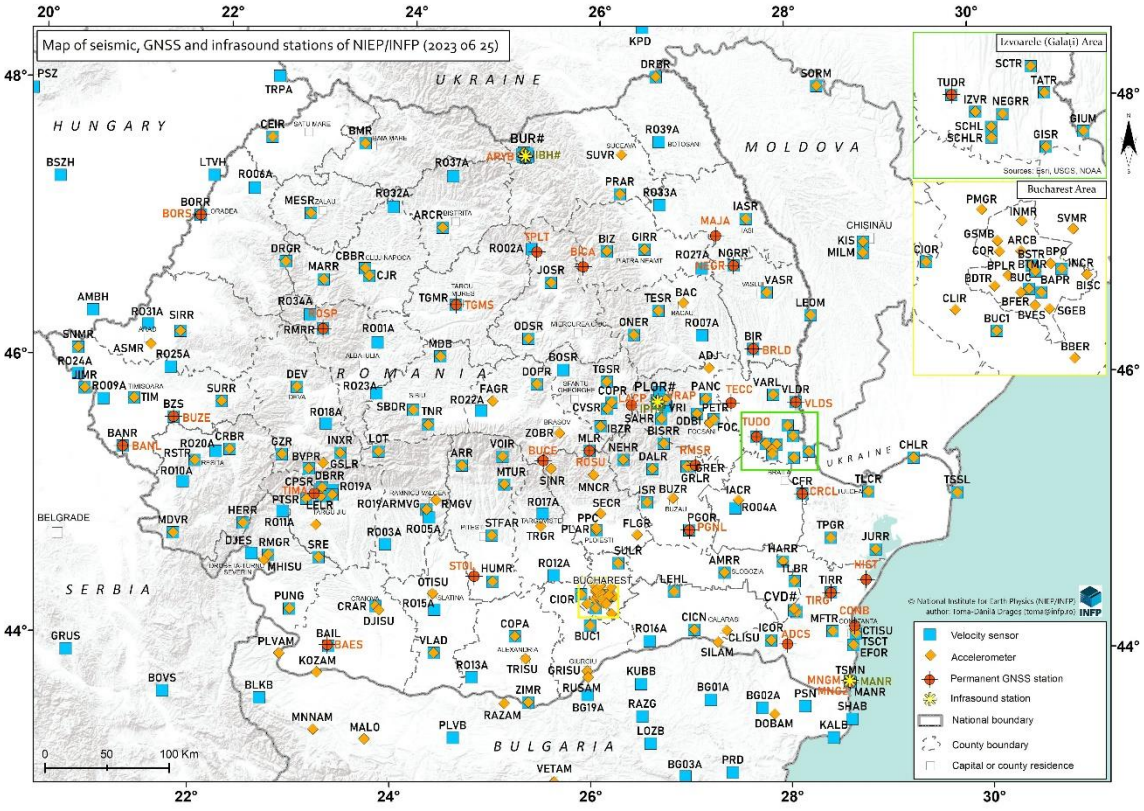


Figure S1. The Romanian Seismic Network, as of June 2023 (see also Marmureanu et al., 2021 for more details on the characteristics of stations).

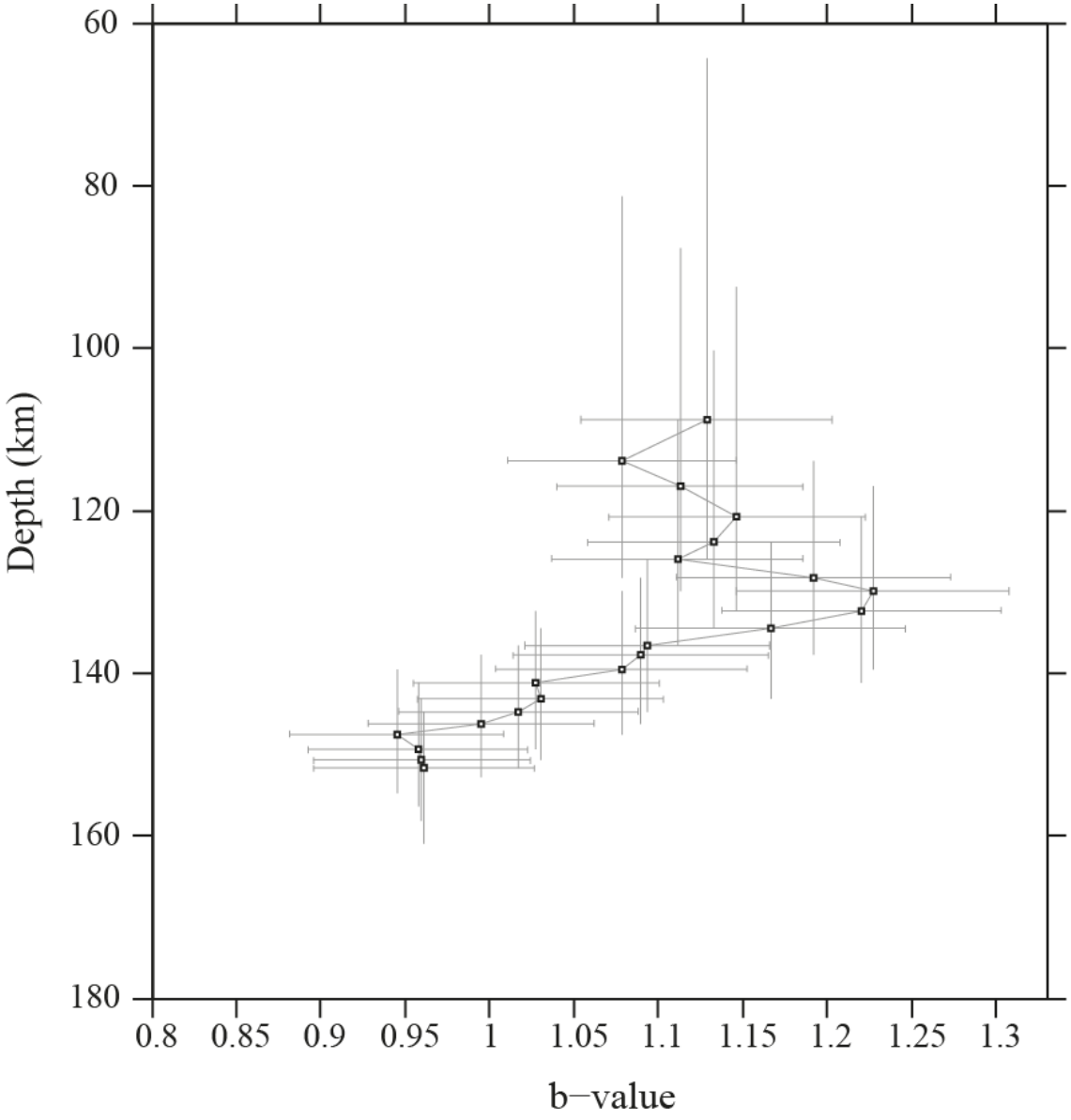


Figure S2. b-value variation with depth for the intermediate-depth Vrancea seismicity, during the period 2005 - 2013, M ≥ 3.2. The b-value is obtained for windows of *ni* = 200 events, shifted by 20 events (overlap factor = 10). The overall b-value variation trend is similar to the one in Figure 5, obtained for a different set of parameters.

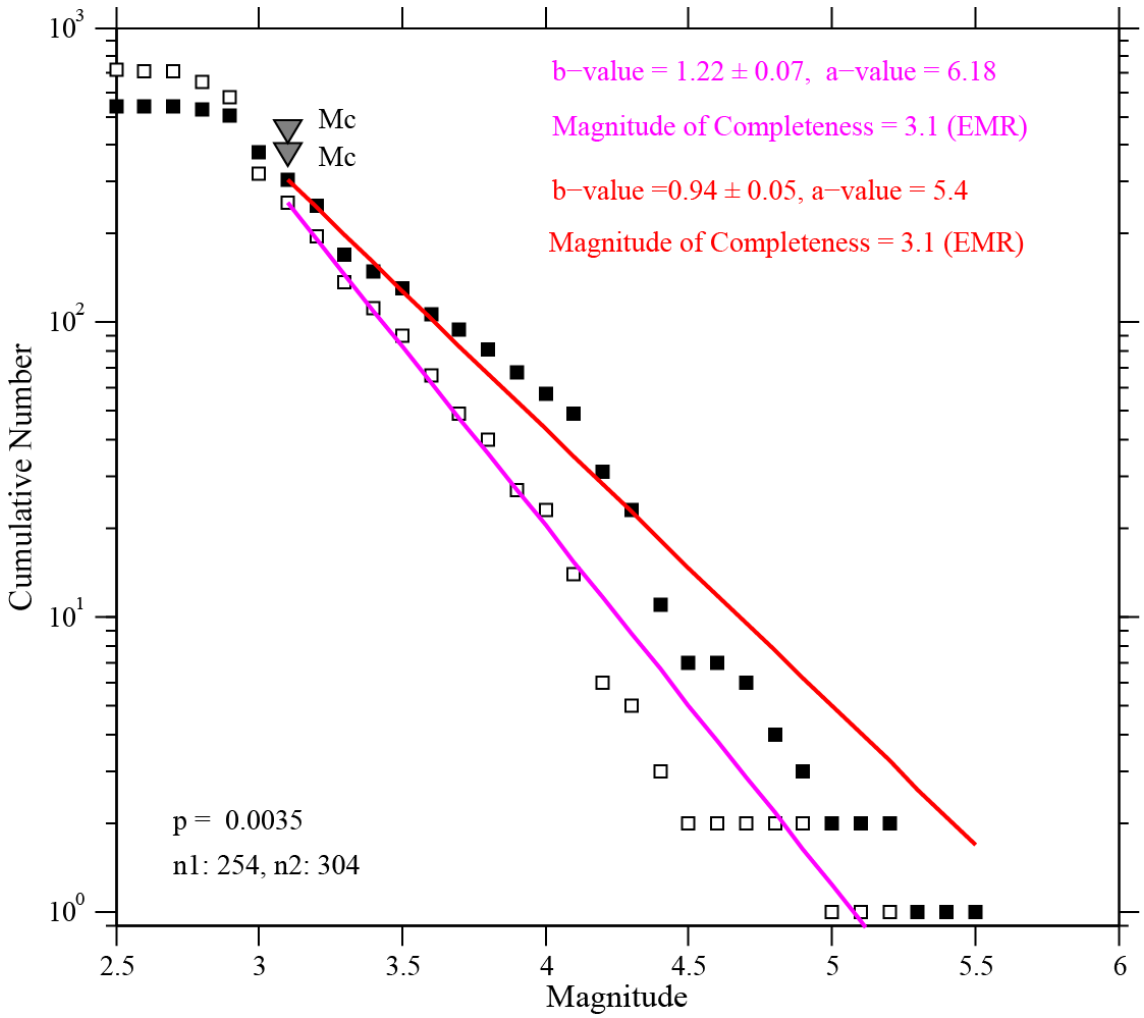
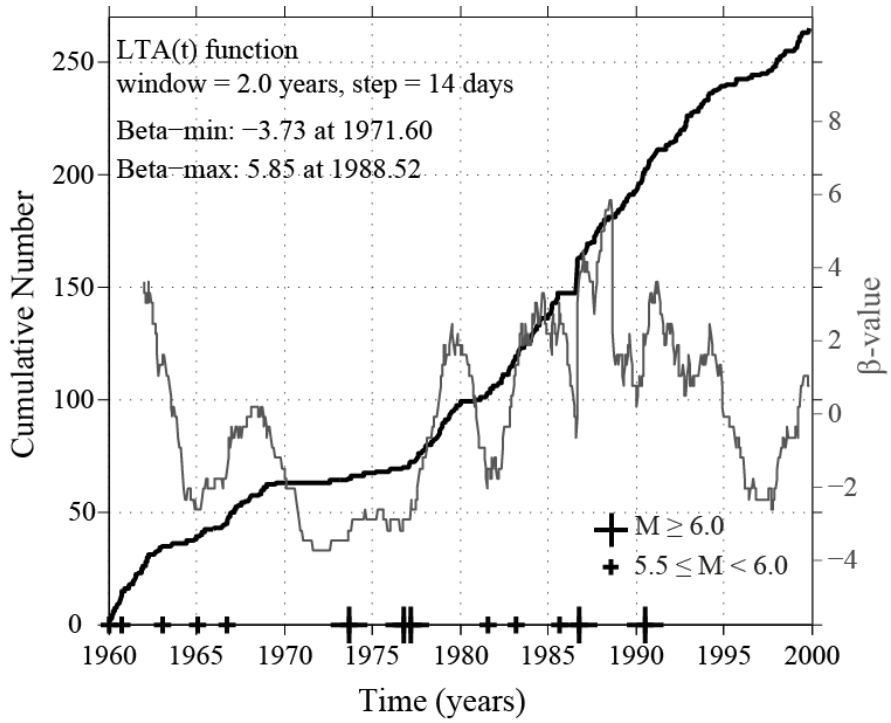
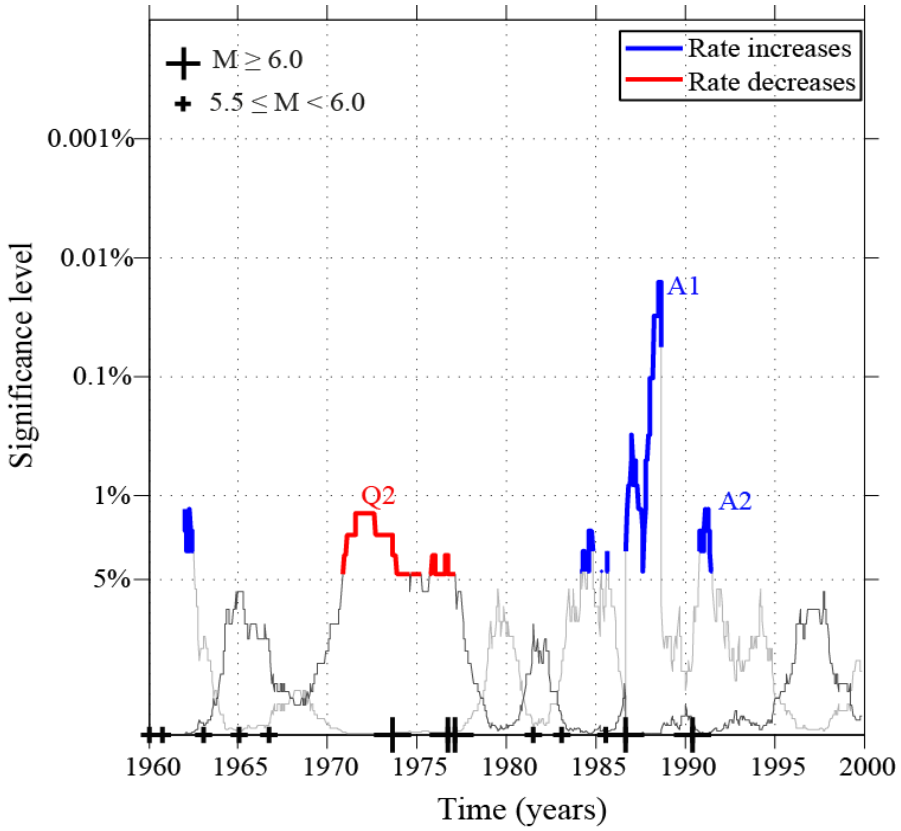


Figure S3. Comparison of frequency-magnitude distributions for the deeper (120 - 140 km, empty rectangles, 254 events) and deepest (140 - 160 km, full rectngles, 304 events) parts of the intermediate-depth Vrancea seismicity (period 2005 - 2013), with the corresponding maximum likelihood fits shown by pink and red colors, respectively, above the magnitude of completeness (*Mc* = 3.1 in both cases) determined using the EMR method (see main text). The 120 - 140 km depth range is characterized by a *b*-value of 1.22 ± 0.07, while the 140 - 160 depth range has a *b*-value of 0.94 ± 0.05. These results are in agreement with those in Figure 5 and S1. The *p* value (= 0.0035) indicates the probability that the two samples come from the same distribution, calculated using Utsu's (1992) test. The very small p value indicates that the two samples likely belong to different populations.


LTA(t) function
window = 2.0 years, step = 14 days
Beta−min: −3.73 at 1971.60
Beta−max: 5.85 at 1988.52
Cumulative Number
β-value
M ≥ 6.0
5.5 ≤ M < 6.0
Time (years)


M ≥ 6.0
5.5 ≤ M < 6.0
Rate increases
Rate decreases
Significance level
A1
A2
Q2
Time (years)

(b)

Figure S4. (a) Cumulative number of earthquakes (black curve) and β-value variation (LTA(t) function, gray curve) for the Vrancea intermediate-depth earthquakes ($M \geq 4.0$, 1960 – 2000). The window-used to calculate the β-value is 2.0 years, moved along the entire time interval with a step of 14 days. The large and small crosses on the time axis indicate events with magnitudes $M \geq 6.0$ and $5.5 \leq M < 6.0$, respectively. (b) Significance of rate increases and decreases in (a) obtained using a similar procedure to that used to obtain Figure 9b. Blue and red colors indicate windows of rate increase and decrease, respectively, that have significance levels below 5% (confidence levels above 95%). The large and small crosses on the time axis indicate events with magnitudes $M \geq 6.0$ and $5.5 \leq M < 6.0$, respectively. The Q2 rate decrease anomaly corresponds to a period before the 1977 M7.4 Vrancea earthquake,while the A1 and A2 anomalies correspond to seismicity activations (rate increases) following the 1986 M7.1 and 1990 M6.9 Vrancea earthquakes.