

Supplementary Material for: A quasi-real-time system for automatic local event monitoring in Germany

Catalina Ramos^{1,*}, Stefanie Donner^{1,2}, and Klaus Stammer¹

¹Federal Institute for Geosciences and Natural Resources (BGR), Hanover, Germany

²Institute of Geophysics, Center for Earth System Research and Sustainability (CEN), Hamburg, Germany

*Corresponding author: catalina.ramosdomke@bgr.de

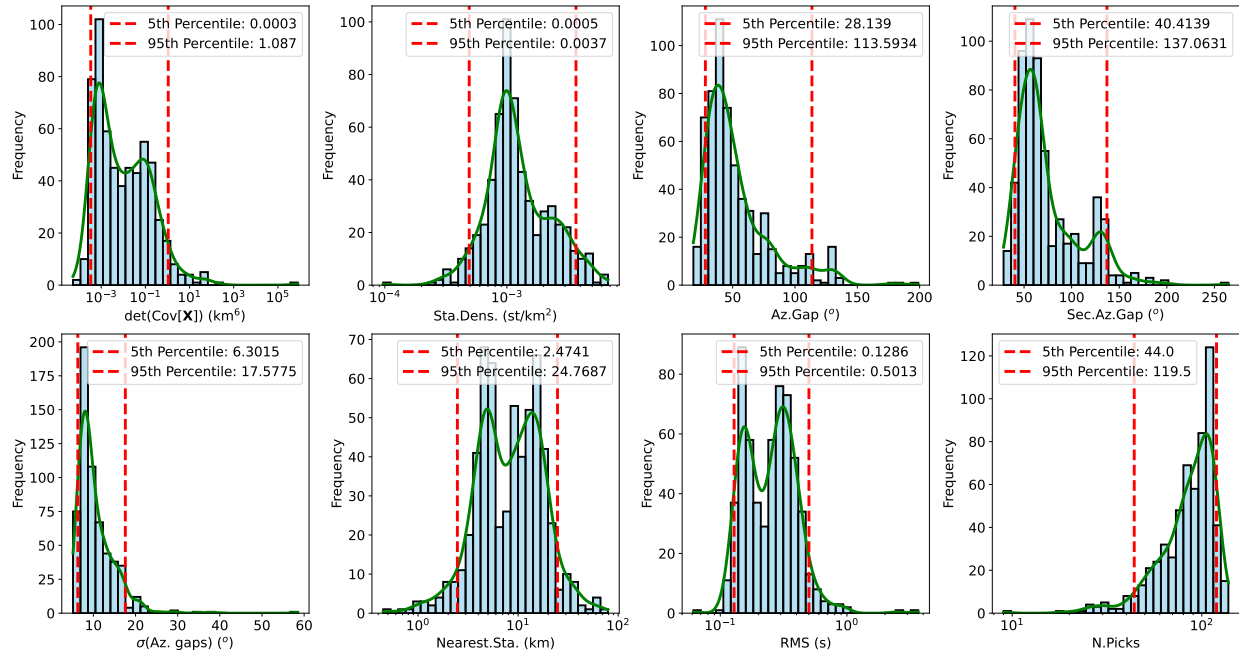


Figure S1. Histograms showing the distribution of the eight parameters that define the Location Quality Score (LQS) for the 594 events in the BGR manual catalog. Green lines: kernel density estimate curves. Red dashed lines: 5th and 95th percentiles of each parameter.

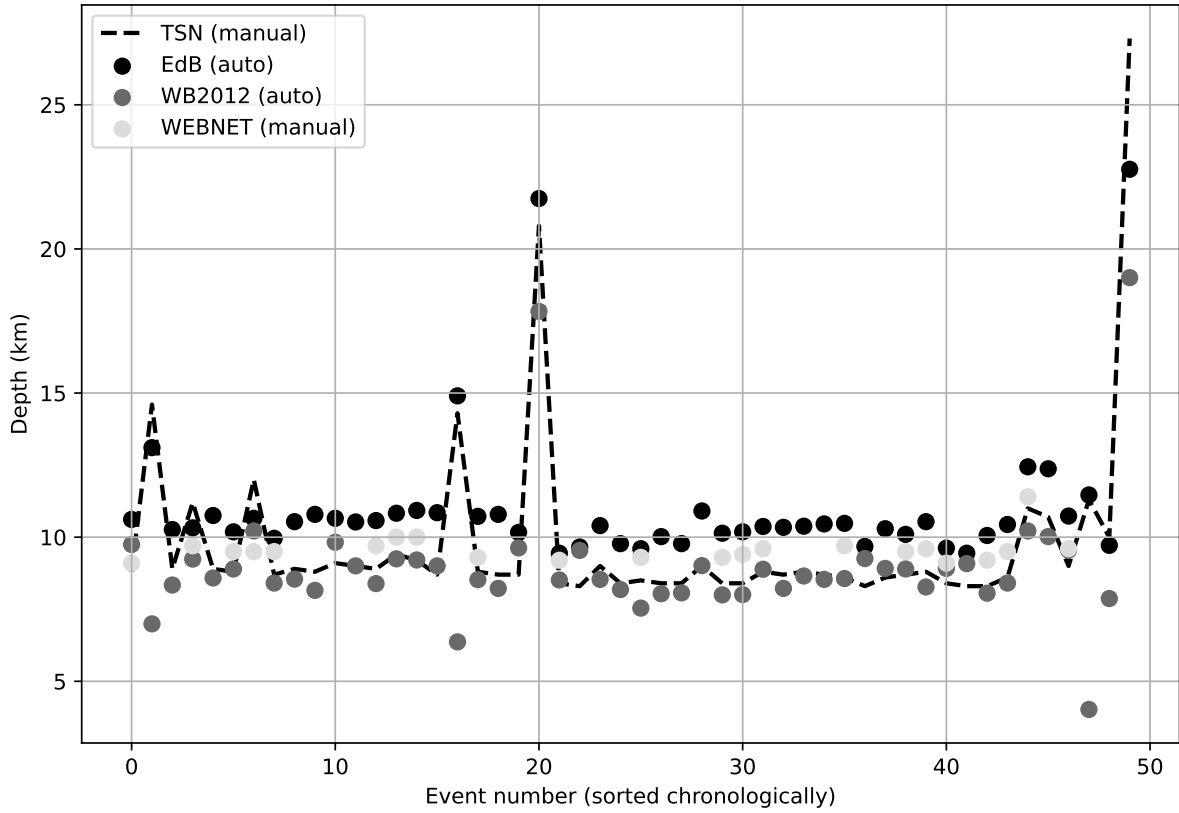


Figure S2. Comparison of hypocenters for 50 events in the West Bohemia/Vogtland region obtained from different catalogs. Black dashed line: manual depths from the TSN catalog (Thüringer Seismologisches Netz; Institut für Geowissenschaften, Friedrich-Schiller-Universität Jena, 2009). Black dots: automatic hypocenter estimates from TieBeNN using BGR's 1D layer-over-halfspace velocity model. Medium gray dots: automatic hypocenter estimates from TieBeNN using the 1D approximation of the WB2012 velocity model (Růžek & Horálek, 2013). Light gray dots: manual depths from the WEBNET catalog (West Bohemia Local Seismic Network; Institute of Geophysics, Academy of Sciences of the Czech Republic, 1991). Events are sorted chronologically.

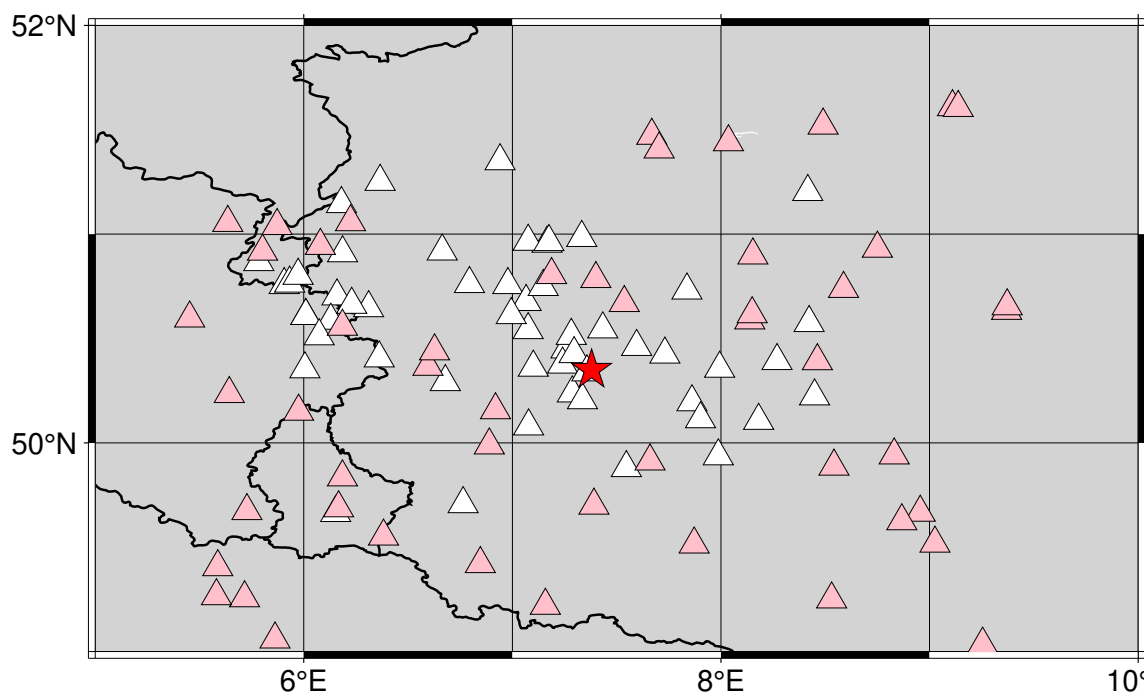


Figure S3. Epicenter of the synthetic events used in our test (red star). White triangles indicate the locations of real stations in the area, while pink triangles represent synthetic stations.

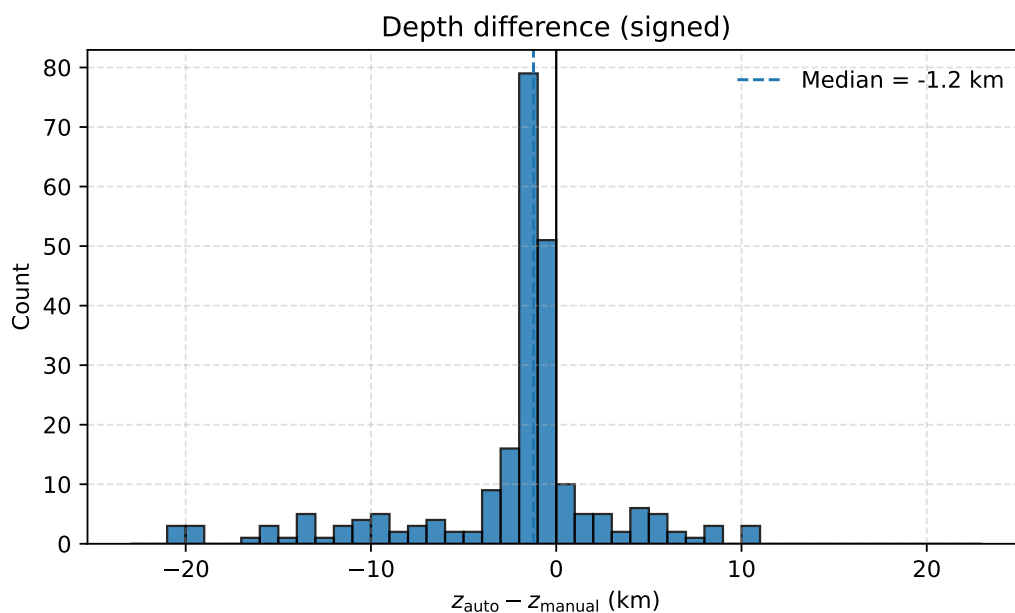


Figure S4. Histogram of $z_{\text{auto}} - z_{\text{manual}}$; zero indicates no bias. Vertical dashed line shows the median.

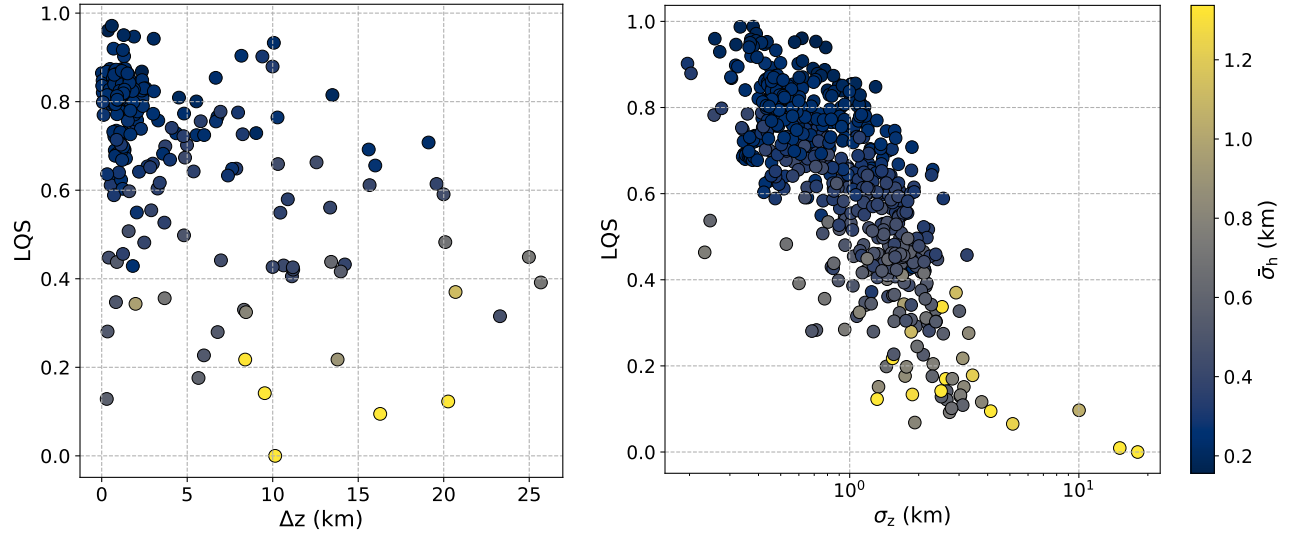


Figure S5. (left) LQS vs. depth misfit $\Delta z = |z_{\text{auto}} - z_{\text{manual}}|$; (right) LQS vs. vertical uncertainty σ_z . Points are colored by the mean horizontal uncertainty $\bar{\sigma}_h = 0.5 * (\sigma_x + \sigma_y)$.

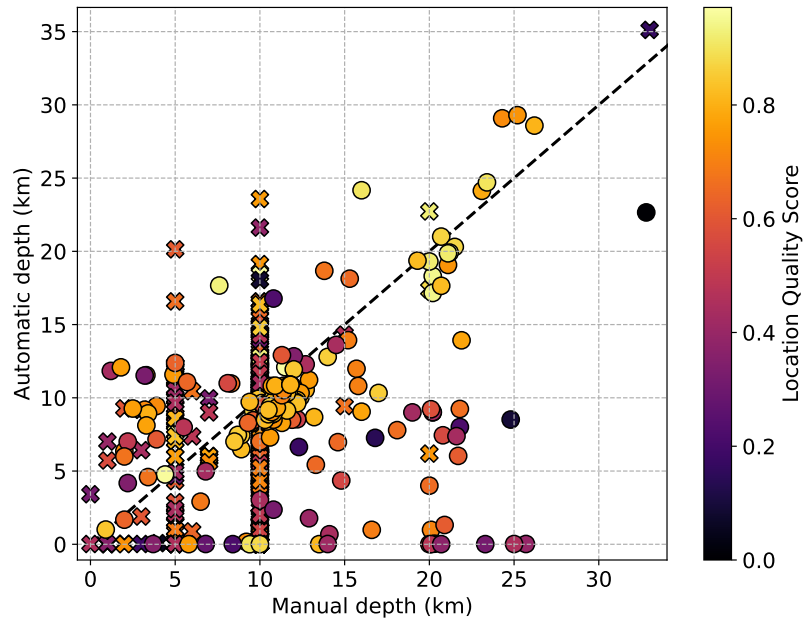


Figure S6. Automatic versus manual focal depths for the full BGR test catalog. Circles represent events with manually determined (non-fixed) depths, while crosses indicate events with fixed manual depths. Points are colored by LQS. Fixed-depth events cluster at common catalog values (e.g., 10 km).

References

Institut für Geowissenschaften, Friedrich-Schiller-Universität Jena. Thüringer Seismologisches Netz [Data set]. (2009). DOI: 10.7914/SN/TH

Institute of Geophysics, Academy of Sciences of the Czech Republic. West Bohemia Local Seismic Network [Data set]. (1991). DOI: 10.7914/SN/WB

Růžek, B. and Horálek, J. (2013). Three-dimensional seismic velocity model of the West Bohemia/Vogtland seismoactive region. *Geophysical Journal International*, 195(2), 1251–1266, DOI: 10.1093/gji/ggt295