SUPPLEMENTAL MATERIAL FOR

A NEW VIEW OF SEISMICITY UNDER ETNA VOLCANO, ITALY, 2014-2023 FROM MULTI-SCALE HIGH-PRECISION EARTHQUAKE RELOCATIONS

Anthony Lomax[1], Tiziana Tuvè[2], Elisabetta Giampiccolo[2], Ornella Cocina[2]

[1] ALomax Scientific, Mouans-Sartoux, France
[2] INGV, Sezione di Catania – Osservatorio Etneo. Piazza Roma, 2 – 95125, Catania, Italy

The Supplementary Material includes:

1) This text file with **Supplementary Figures S1-S6**.
2) **Supplementary File S1 (File_S1_catalog_config_run.zip)** – An archive file containing the full NLL-SSST-coherence relocation catalog in NLL-hypocenter (20240724A_Etna_Seismicity_2014-2023_INGV-OE_NLL-SC.hyp) and CSV (20240724A_Etna_Seismicity_2014-2023_INGV-OE_NLL-SC.csv) formats, as well as metadata and configuration files used to run the NLL-SSST-coherence relocations presented in this study.
   This archive and a stand-alone copy of 20240724A_Etna_Seismicity_2014-2023_INGV-OE_NLL-SC.csv are both available at https://doi.org/10.5281/zenodo.13862396.
3) **Movie_S1_Etna_Seismicity_INGV-OE_NLL-SC.mp4** and **Movie_S2_Etna_Seismicity_INGV-OE_NLL-SC.mp4** – 3D animations from different viewpoints of the NLL-SSST-coherence relocations presented in this study.
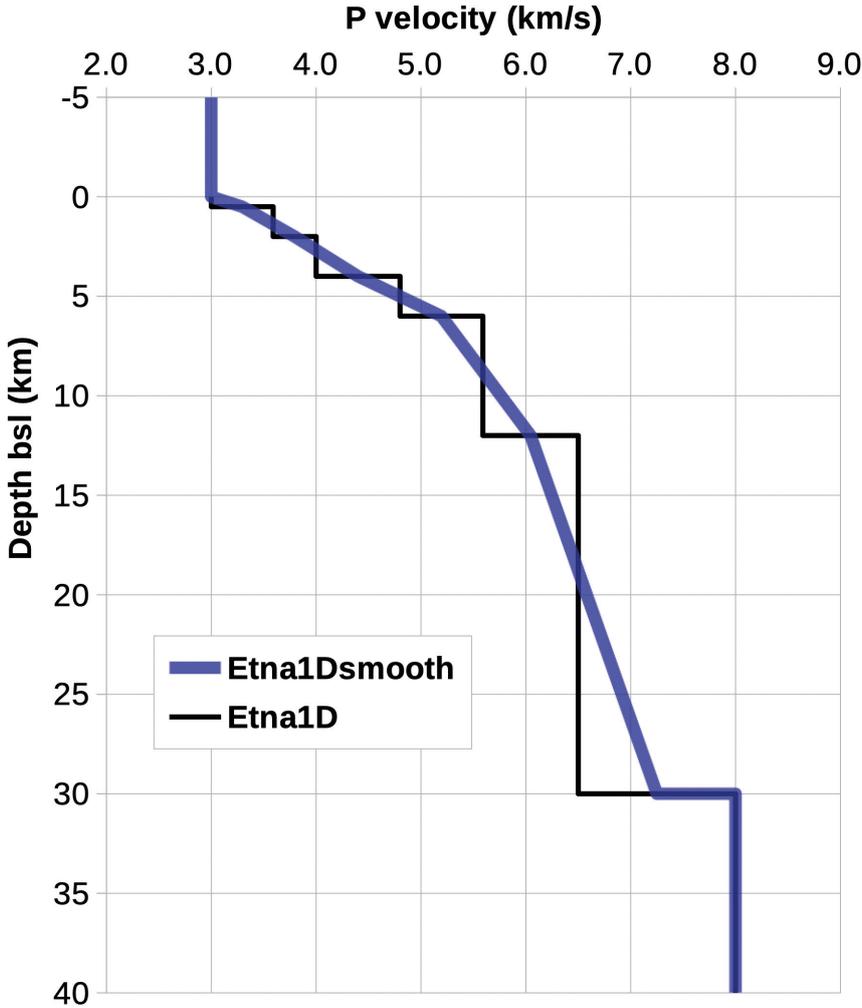
Figure S1. Initial P-wave velocity model used for NLL–SSST-coherence relocation. Initial NLL relocations are done with the piecewise-linear smooth model Etna1Dsmooth, derived from the Etna1D model (Hirn et al., 1991), using Vp/Vs = 1.70 to determine S-wave velocity. The Etna1Dsmooth model is tabulated in the configuration file Etna_2024_Etna1Dsmooth.in included in Supplementary File S1.
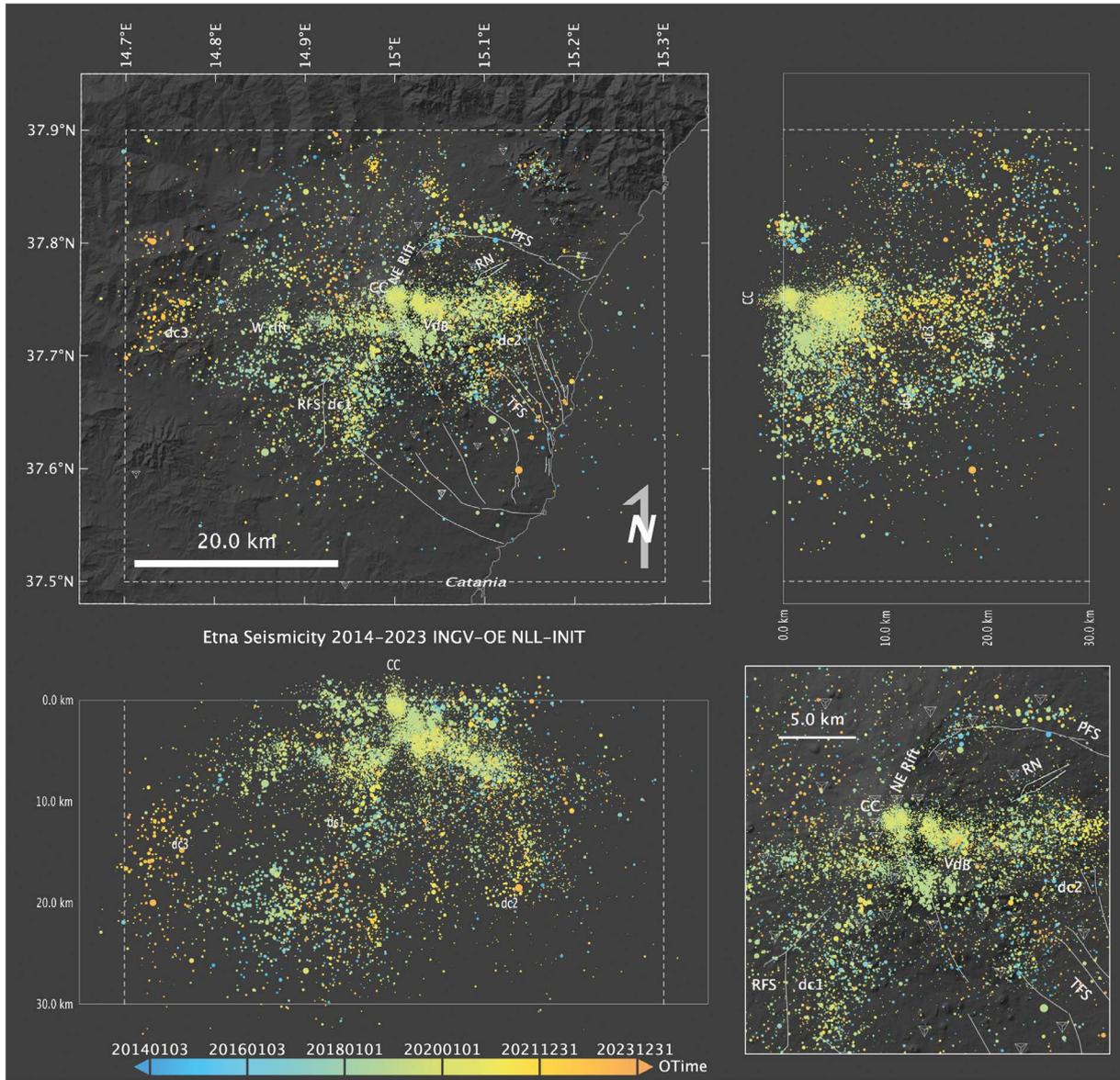
Figure S2. Initial NLL locations for 2014-2023 seismicity at Mt. Etna. The full set of 15199 expectation hypocenters for all available events are shown, with other map elements as in Fig. 2 in the main text.
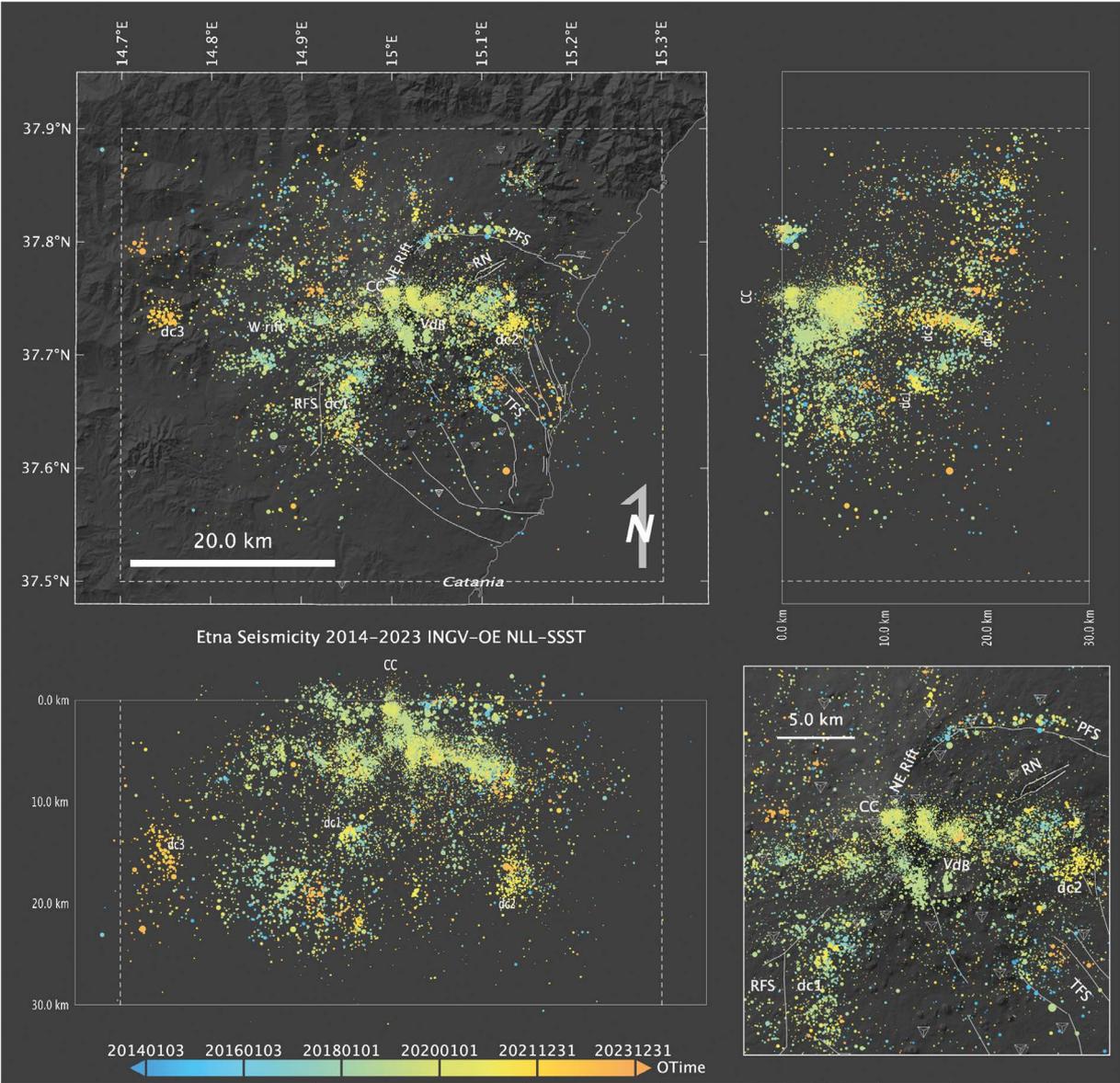
Figure S3. Final NLL-SSST relocations for 2014-2023 seismicity at Mt. Etna. Expectation hypocenters for all available events are shown, with other map elements as in Fig. 2 in the main text.

Figure S4. Final NLL-SSST-coherence relocations for 2014-2023 seismicity at Mt. Etna. Expectation hypocenters for all available events are shown, with other map elements as in Fig. 2 in the main text.
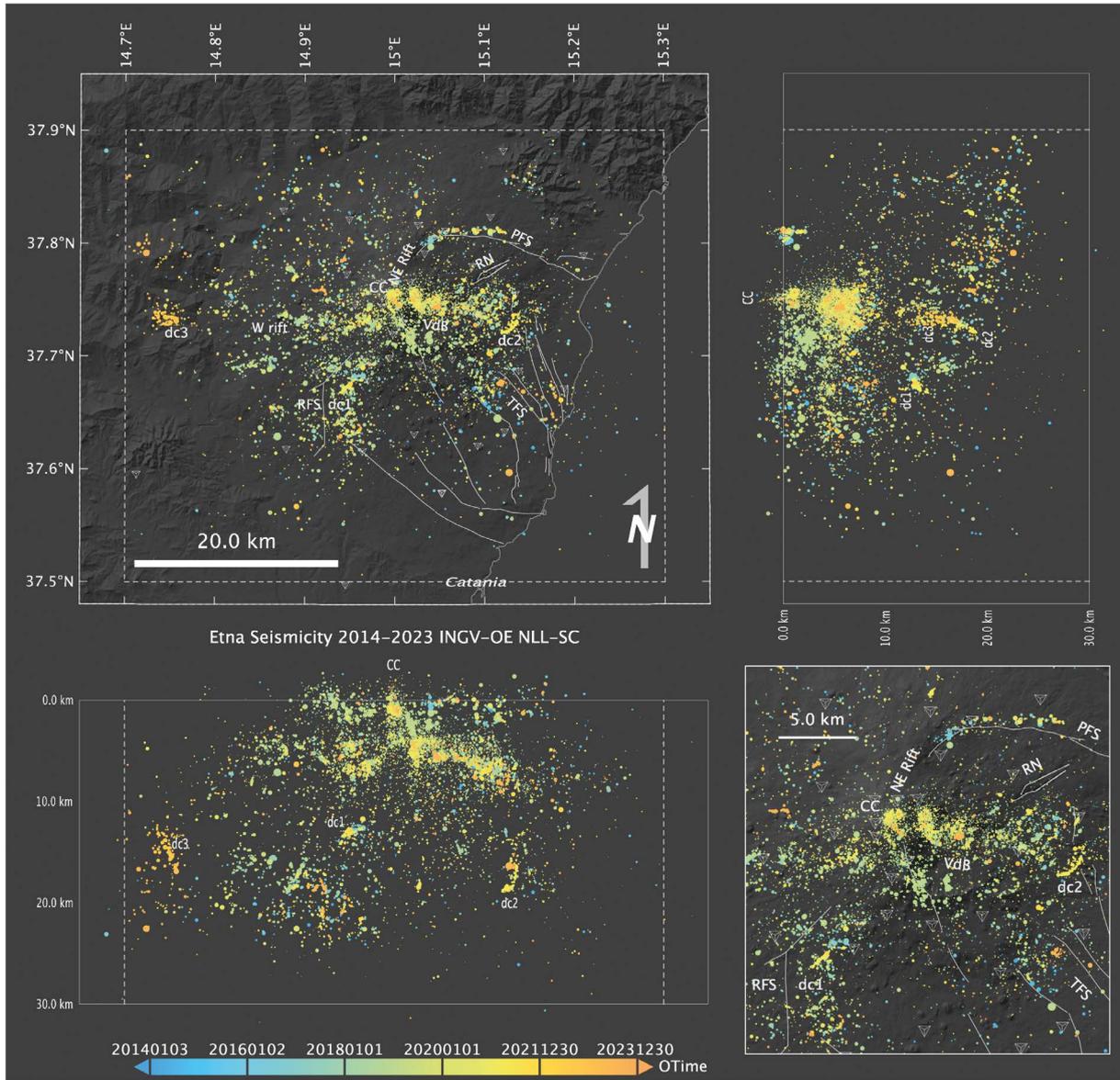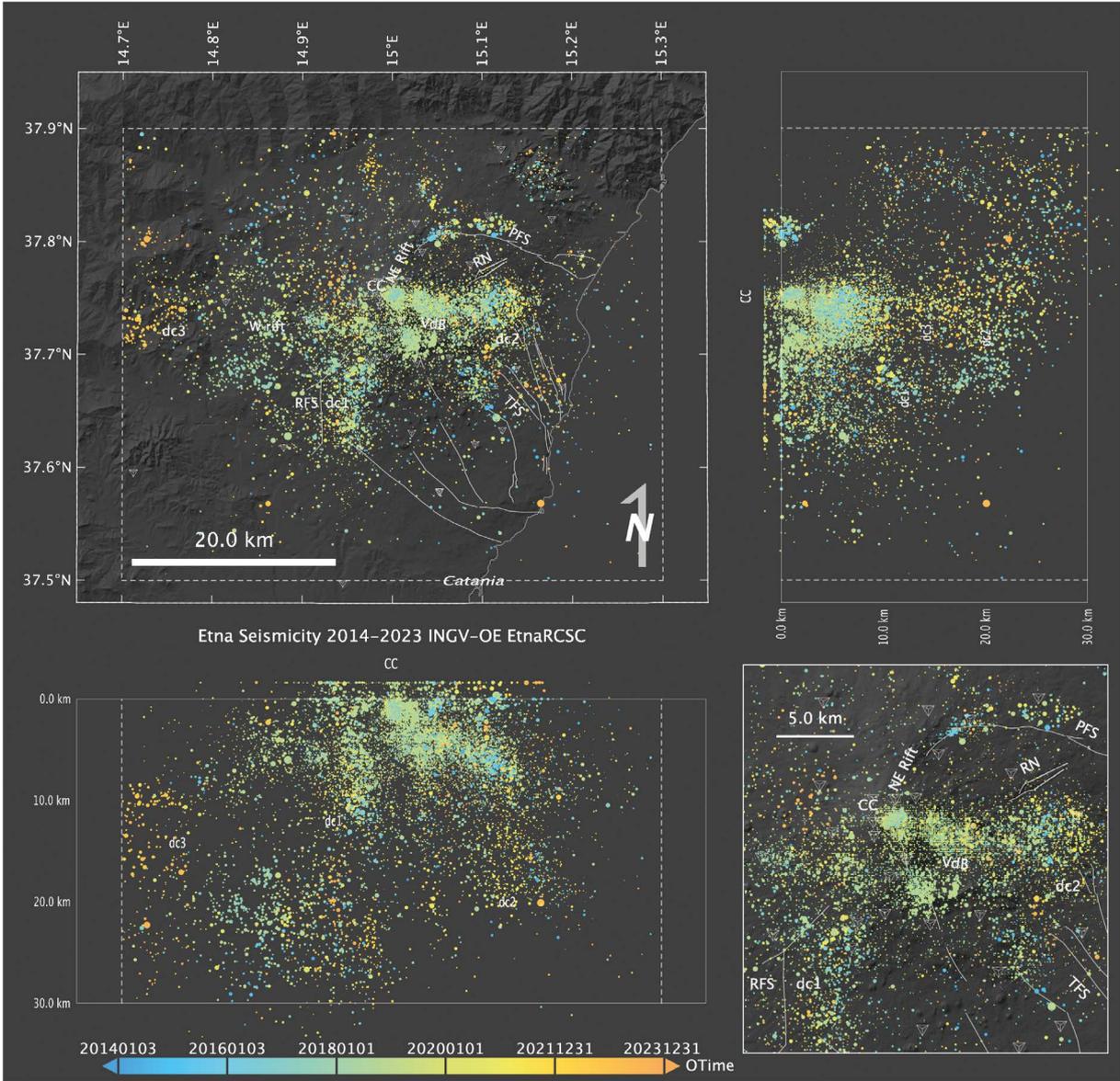
Figure S5. INGV-OE RCSC catalog locations for 2014-2023 seismicity at Mt. Etna. 15687 hypocenters are shown, with other map elements as in Fig. 2 in the main text.

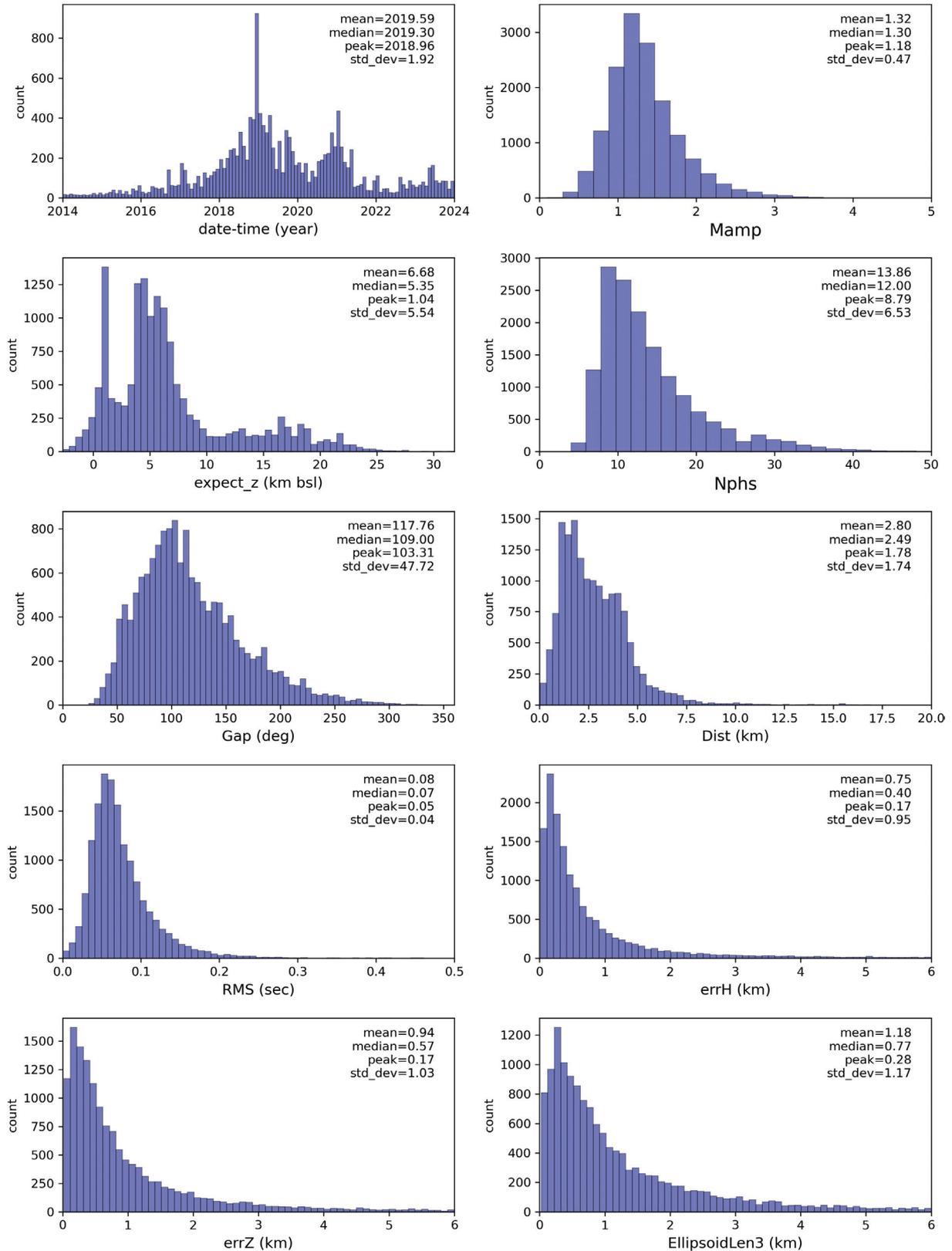## Etna Seismicity 2014-2023 INGV-OE NLL-SC Catalog (15199 events)

Figure S6. Statistics and histograms for all, final NLL-SSST-coherence relocations for 2014-2023 seismicity at Mt. Etna. Mamp = INGV_OE catalog magnitude; expect_z = expectation hypocenter depth; Nphs = number of phases used; Gap = maximum azimuth gap; Dist = distance to closest station; RMS = root-mean-square of (posterior) weighted phase residuals; errH = standard error in epicenter; errZ = standard error in depth; EllipsoidLen3 = length of semi-major axis of 68% x, y, z confidence ellipsoid.

Anthony Lomax et al.

References

Hirn, A., A. Nercessian, M. Sapin, F. Ferrucci et al. (1991). Seismic heterogeneity of Mt Etna: structure and activity, Geophys. J. Int., 105, 139-153, doi:10.1111/j.1365-246X.1991.tb03450.x.