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Erratum to Multi-Event Explosive Seismic Source for the 2022 M_w 6.3 Hunga Tonga Submarine Volcanic Eruption

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In Thurin *et al.* (2022), we considered two different point-source models: a moment tensor and a force. We estimated the best-fitting source models by searching over model parameter space to find the source whose synthetic seismograms provided the best fit to observed seismograms. We used synthetic seismograms from the Incorporated Research Institutions for Seismology (IRIS) Data Services product Syngine (Krischer *et al.*, 2017), which uses Green's function databases from Instaseis (van Driel *et al.*, 2015) that are constructed from 2D wavefield simulations within a radially symmetric Earth model using the code AxiSEM (Nissen-Meyer *et al.*, 2014).

The radial component of synthetic seismograms from Syngine and Instaseis is flipped in sign, and this error impacted two analyses in the supplemental material of Thurin *et al.* (2022). This issue affects the point-force synthetics but not the moment tensor synthetics. Here, we present the corrected results, which are part of a larger collection in Thurin and Tape (2023).

Figures S12 and S13 in the supplemental material of Thurin *et al.* (2022) were impacted; the corrected versions are shown here in Figures 1 and 2. The second and third paragraphs of Section S1 "Inversions for force" should be replaced with the following text: "The body-wave inversion results (Fig. S12) demonstrate the possibility of a generally downward or generally upward force. The surface-wave inversion results (Fig. S13) are similarly compatible with an up-or-down-directed point force. For both the data sets, the downward-directed force provides a better fit to waveforms than an upward-directed force."

With the two corrected figures in the supplemental material, the corresponding text of the main article needs to be updated. In the section "Analysis of Teleseismic *P* Waves" in the original article Thurin *et al.* (2022), the following sentences "As shown in Figure S12, we were unable to fit both the radial and vertical components of the *P* waves using any point force. We were also unable to fit the regional surface waves using any point force (Figs. S12c and S13). For both the regional surface waves and the teleseismic *P* waves, a point-source moment tensor provides better waveform fits than a force."

should be revised to

"The best-fitting point force for teleseismic *P* waves and regional surface waves is in a downward direction (Figs. S12 and S13), in general agreement with the chosen model of Yuen *et al.* (2022). For the case of teleseismic *P* waves, a force provides a slightly lower misfit than a moment tensor. For the case of surface waves, the moment tensor provides lower misfit than a force."

Misfit values for these runs (SF5, SM5, SF8, and SM8) can be found in table Z1 of Thurin and Tape (2023; doi: 10.5281/zenodo.7811955).

The Instaseis GitHub repository (https://github.com/krischer/instaseis/) was established on 21 August 2014. The error in the radial-component force-generated synthetic seismograms was identified in the Instaseis GitHub repository on 7 July 2020 (https://github.com/krischer/instaseis/issues/77). The erroneous seismograms were used within part of our study in 2022, and the issue has not been fixed in Instaseis as of today (6 April 2023). We made the correction in our moment tensor (and force) estimation code (MTUQ: https://github.com/uafgeotools/mtuq) on 25 January 2023, such that the MTUQ will flip the radial component of force-generated Instaseis synthetic seismograms, thereby correcting the Instaseis issue. (A similar correction is applied within the landslide-modeling code—lsforce (Toney and Allstadt, 2021), which also access force generated synthetic

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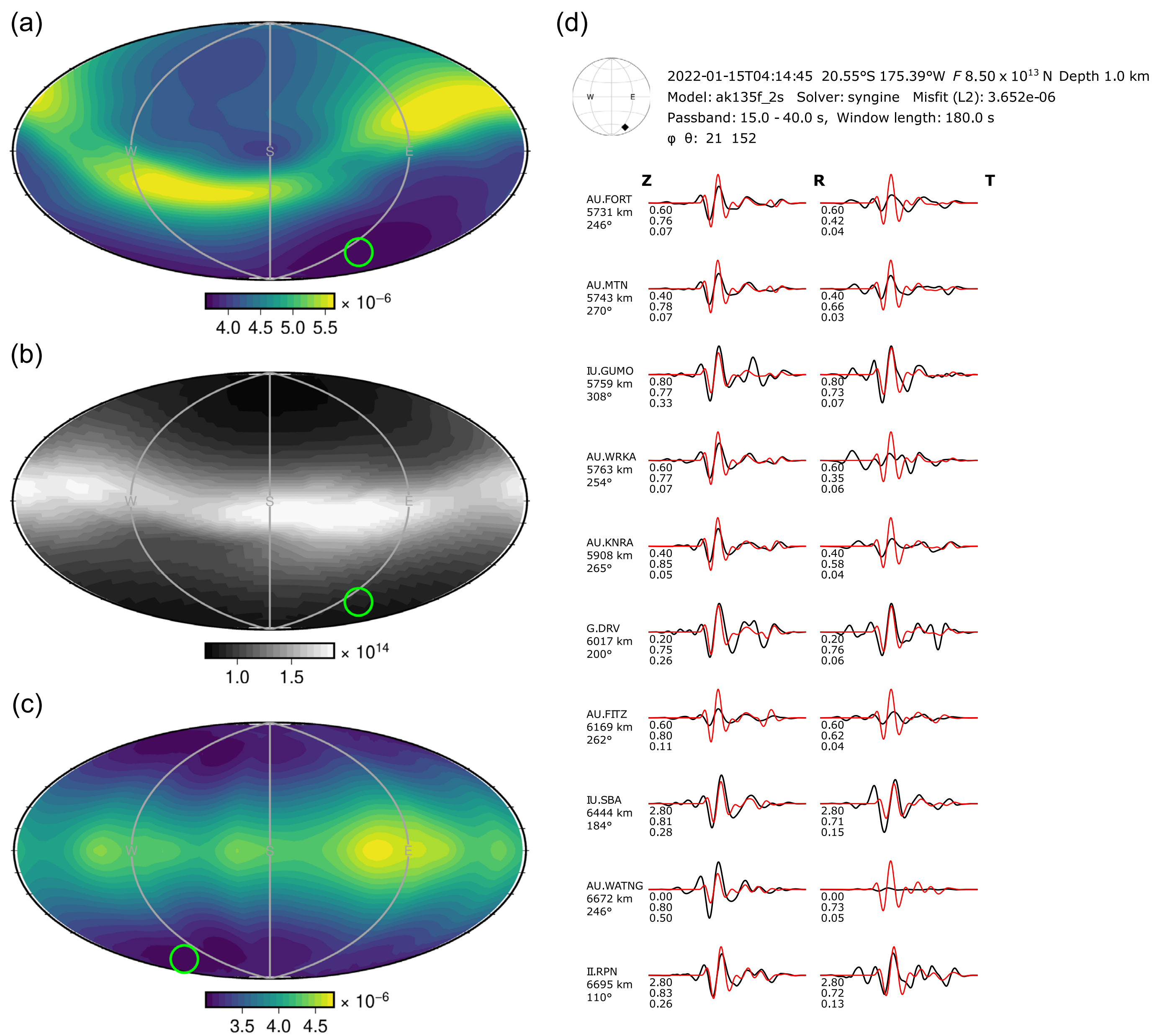

Figure 1. Point force inversion results for subevent S1 for a fixed depth of 1 km. Plots (a,b,d) are for body waves, whereas panel (c) is for surface waves. (a) Point force misfit map (in polar coordinates) for body waves. The best-fitting force is a subvertical downward force ($\theta = 152°$) with a deflection toward the east ($\varphi = 21°$, azimuth 69°). (b) Amplitude of the best-fitting force for each force direction. (c) Point force misfit map for the surface-wave inversion. Waveform fits for the best-fitting source are shown in Figure 2. (d) Subset of body-wave waveform fits for the best-fitting point force. Correction to figure S12 of Thurin *et al.* (2022).

seismograms via Syngine and Instaseis.) Any previous or ongoing study that uses AxiSEM force (not moment tensor) synthetics, via Instaseis or Syngine, should re-examine their analysis to see if it was impacted by flipped-sign radial component synthetic seismograms. This includes the downloadable databases available at http://ds.iris.edu/ds/products/syngine/. All websites were last accessed in April 2023.

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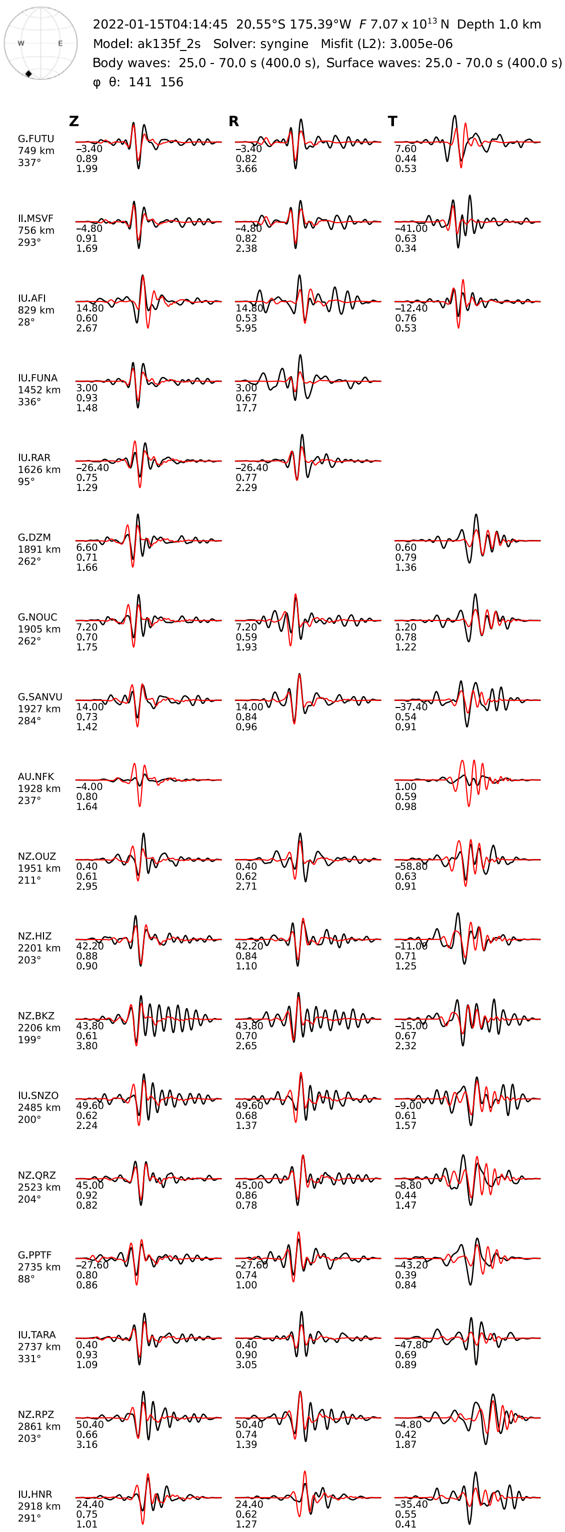

Figure 2. Surface-wave force inversion results for subevent S1. The best-fitting force is a subvertical downward force ($\theta = 156°$) with a deflection toward the northwest ($\varphi = 141°$, azimuth 309°). The corresponding misfit map is shown in Figure 1c. Correction to figure S13 of Thurin *et al.* (2022).

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