Supporting Information for "On the origin of seismic anisotropy in the shallow crust of the Northern Volcanic Zone, Iceland"

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Contents of this file

1. Captions for Datasets S1 to S2
2. Table S1
3. Figures S1 to S3

Introduction

This supporting document contains some additional examples of shear-wave splitting measurements and the results of the parameter trials used for the regridding of shear-wave splitting results as outlined in Sections 3.2.1 and 3.2.2. In addition, there is a table that provides the parameters used by MFAST and the captions for datasets S1 and S2, which can be downloaded separately.

Data Set S1. The input file used for the Coulomb stress modeling outlined in Section 4.2.

Data Set S2. The result file containing all of the splitting measurements used in this study.

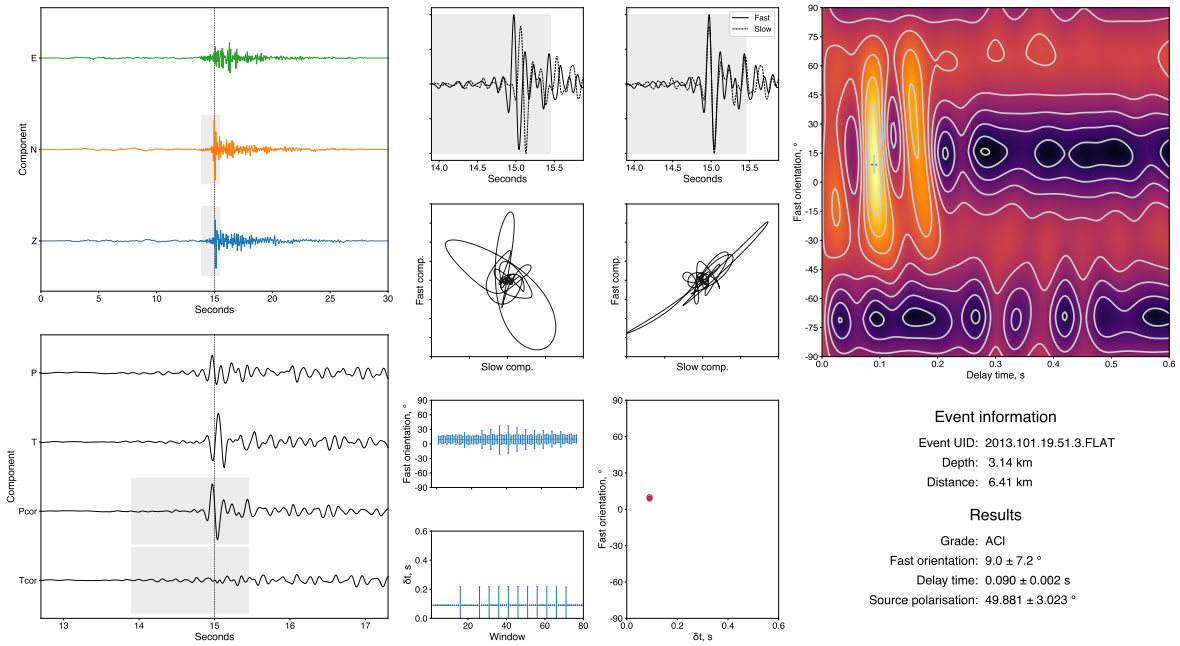

Figure S1. Example of a good splitting measurement at FLAT for a repeating earthquake (multiplet)—see Figure S2. (a) shows the raw data for the East (green), North (orange), and Vertical (blue) components. (b) shows a zoom in around the S phase arrival rotated onto the nominal 'radial' (P) and 'transverse' (T) axes before and after correction for splitting. Panels (c) and (d) show the phase arrivals rotated onto the 'fast' and 'slow' axes before and after correction, with (e) and (f) showing the corresponding particle motion. There is a clear linearisation of the particle motion of the horizontal components and removal of energy from the transverse component. Panels (g) - (i) show the results of the multiple window trials and the cluster analysis. Finally, (j) shows the resultant grid of the minimised eigenvalue. The blue cross denotes the optimal (δt, ϕ) pair.

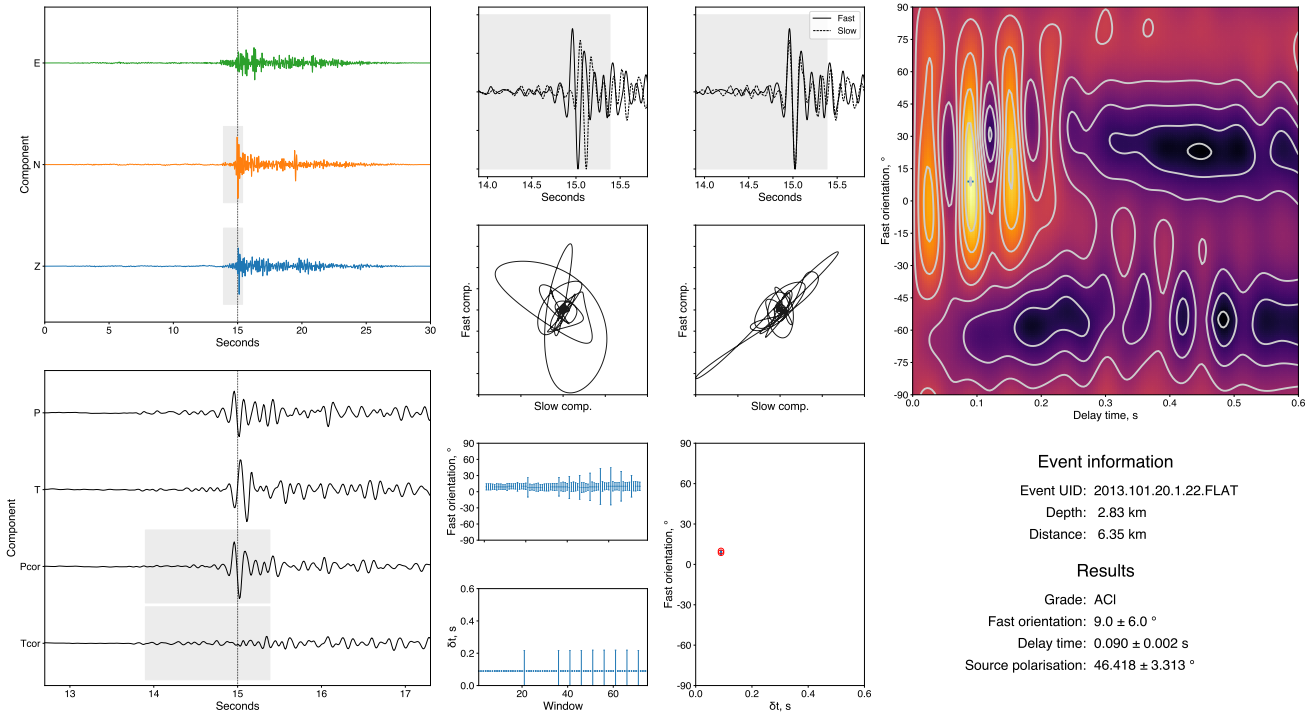

Figure S2. Example of a good splitting measurement at FLAT for a repeating earthquake (multiplet)—see Figure S1. Panels the same as Figure S1.

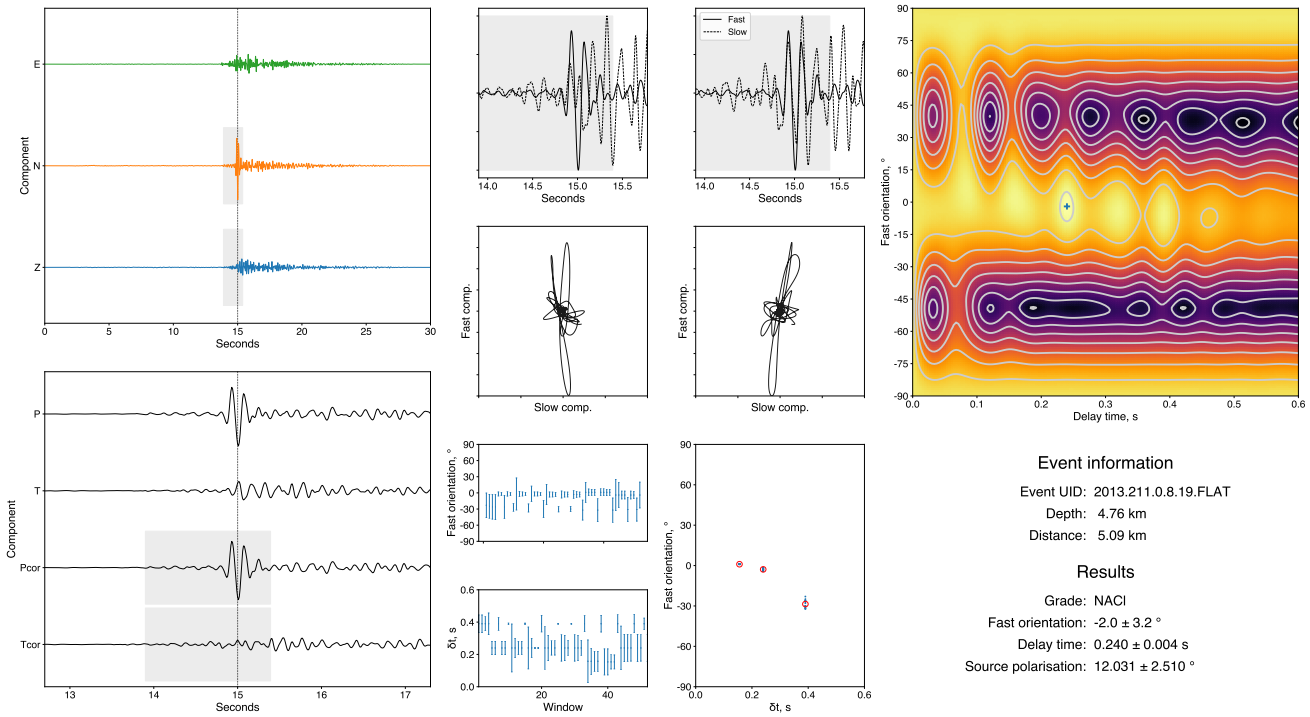

Figure S3. Example of a null splitting measurement at FLAT. Panels the same as Figure S1.

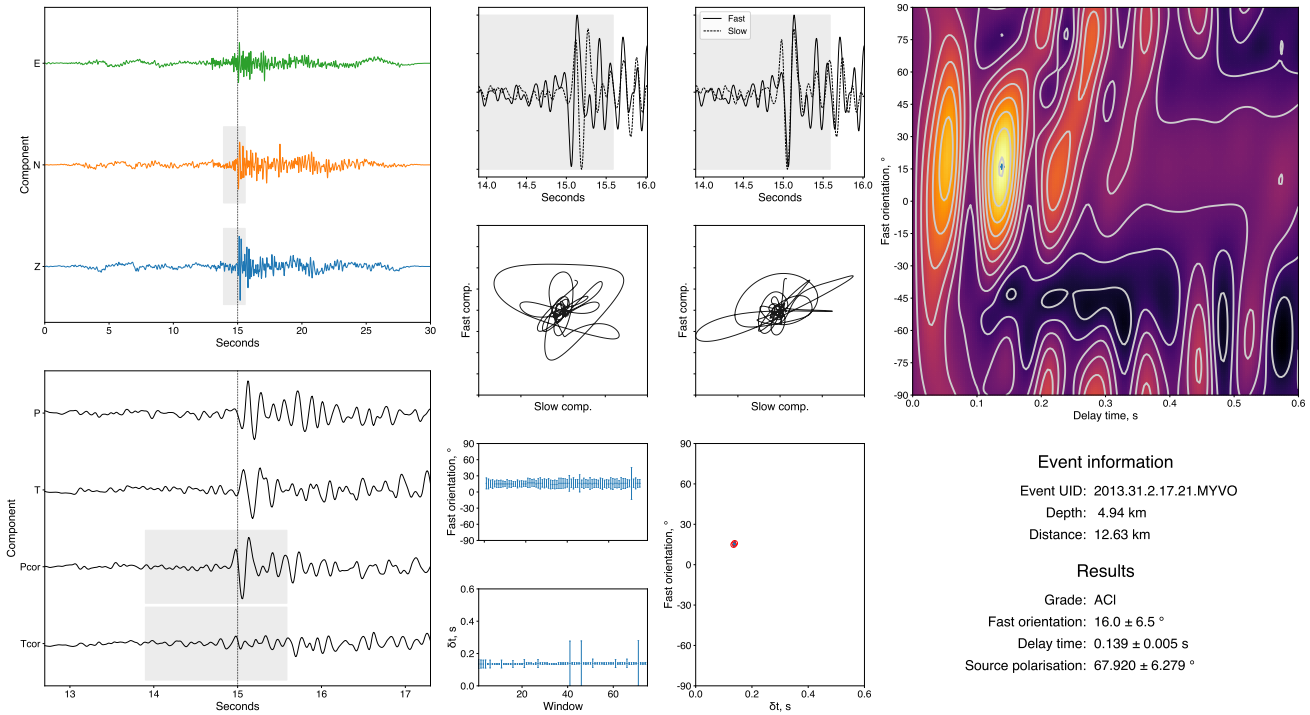

Figure S4. Example of a good splitting measurement at MYVO. Panels the same as Figure S1.

Parameter name	Description	Value
nwbeg	Number of measurement window start times tested	5
nwend	Number of measurement window end times tested	16
dt_beg	Time step size between window start times	0.2
dt_end	Time step size between window end times	0.0158276
dtlag_max	Maximum allowable error in tlag for inclusion in clustering	0.144823
dfast_max	Maximum allowable error in fast for inclusion in clustering	40
t_off_beg	First time of start window	0.3
t_off_end	First time of end window	0.279293
tlag_scale	Maximum time lag	0.579293
fast_scale	Maximum fast direction	180
max_no_clusters	Maximum number of clusters to test during cluster analysis	15
nmin	Minimum number of points in an acceptable cluster	5

Table S1. Table giving the MFAST parameter values used for this study.

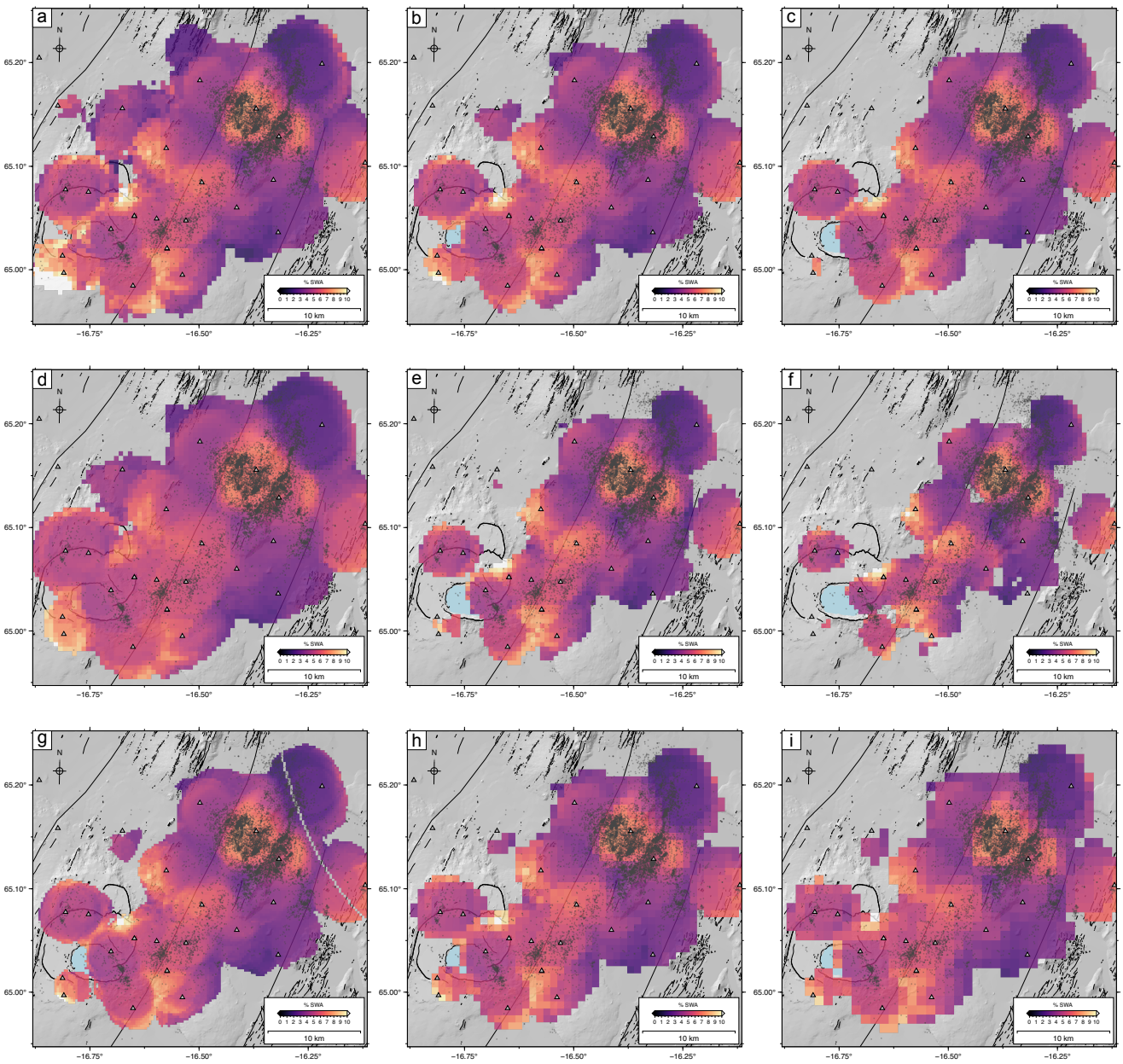

Figure S5. Shear wave anisotropy (SWA) re-gridding parameter trials. Each row shows a different parameter variation: a–c show variations in the minimum number of observations required per cell, with values of 3, 8, and 15 from left to right; d–f show variations in the width of the Gaussian kernel used for smoothing the data, with values of 1500, 2000, and 3500 from left to right; g–i show variations in the grid cell size with values of 0.25 x 0.25 km^2, 0.75 x 0.75 km^2, and 1 x 1 km^2 from left to right. There are no notable differences between the trials, suggesting that the features observed are robust.

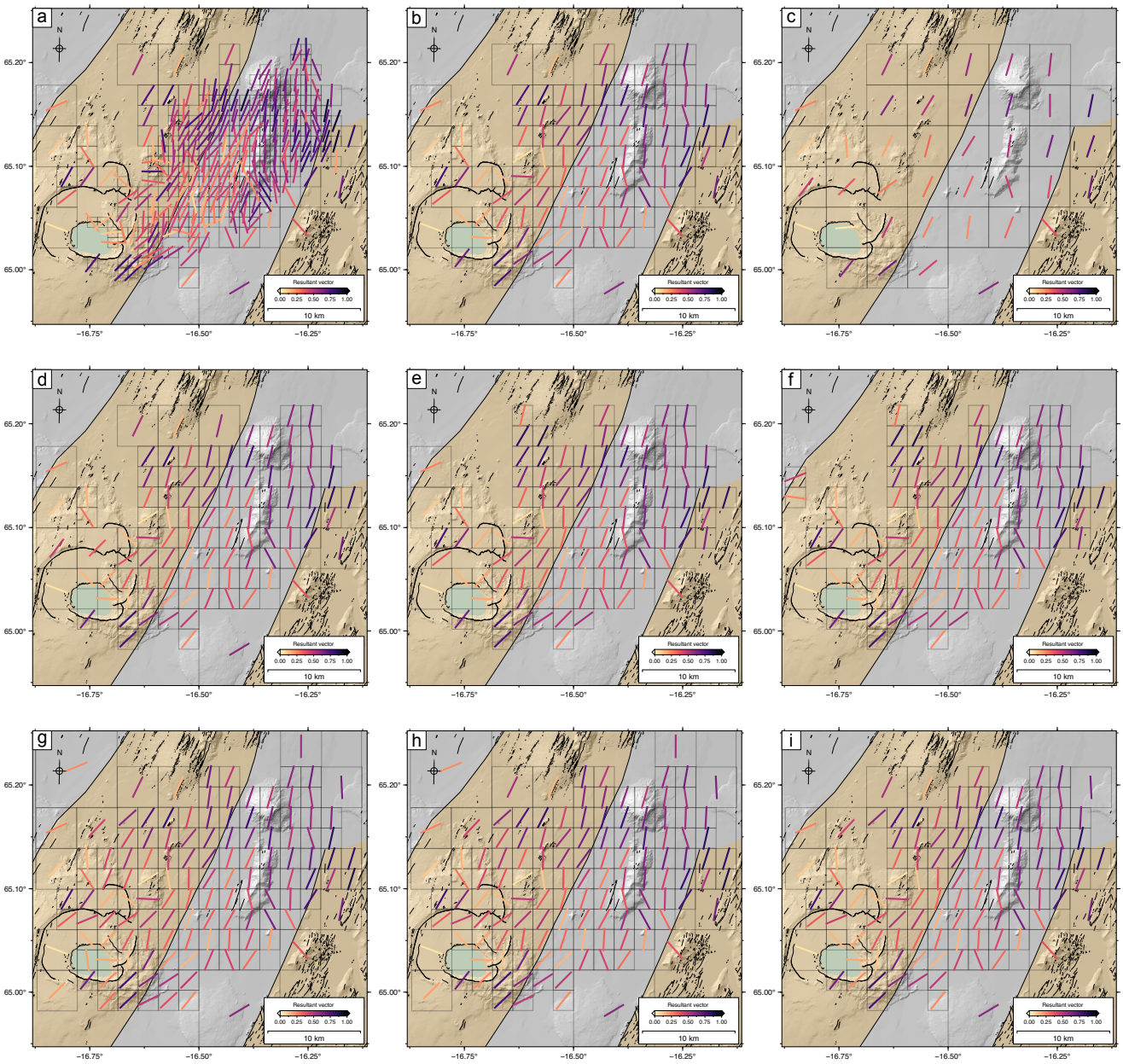

Figure S6. Fast polarization (ϕ) re-gridding parameter trials. Each row shows a different parameter variation: a–c show variations in the minimum cell size, with values of 1 x 1 km^2, 1.5 x 1.5 km^2, and 3 x 3 km^2 from left to right; d–f show variations in the maximum number of observations before a cell is subdivided, n_max, with values of 100, 150, and 250 from left to right; g–i show variations in the minimum number of observations required for a cell to be retained, n_min, with values of 20, 30, and 50 from left to right. There are no notable differences between the trials, suggesting that the features observed are robust.

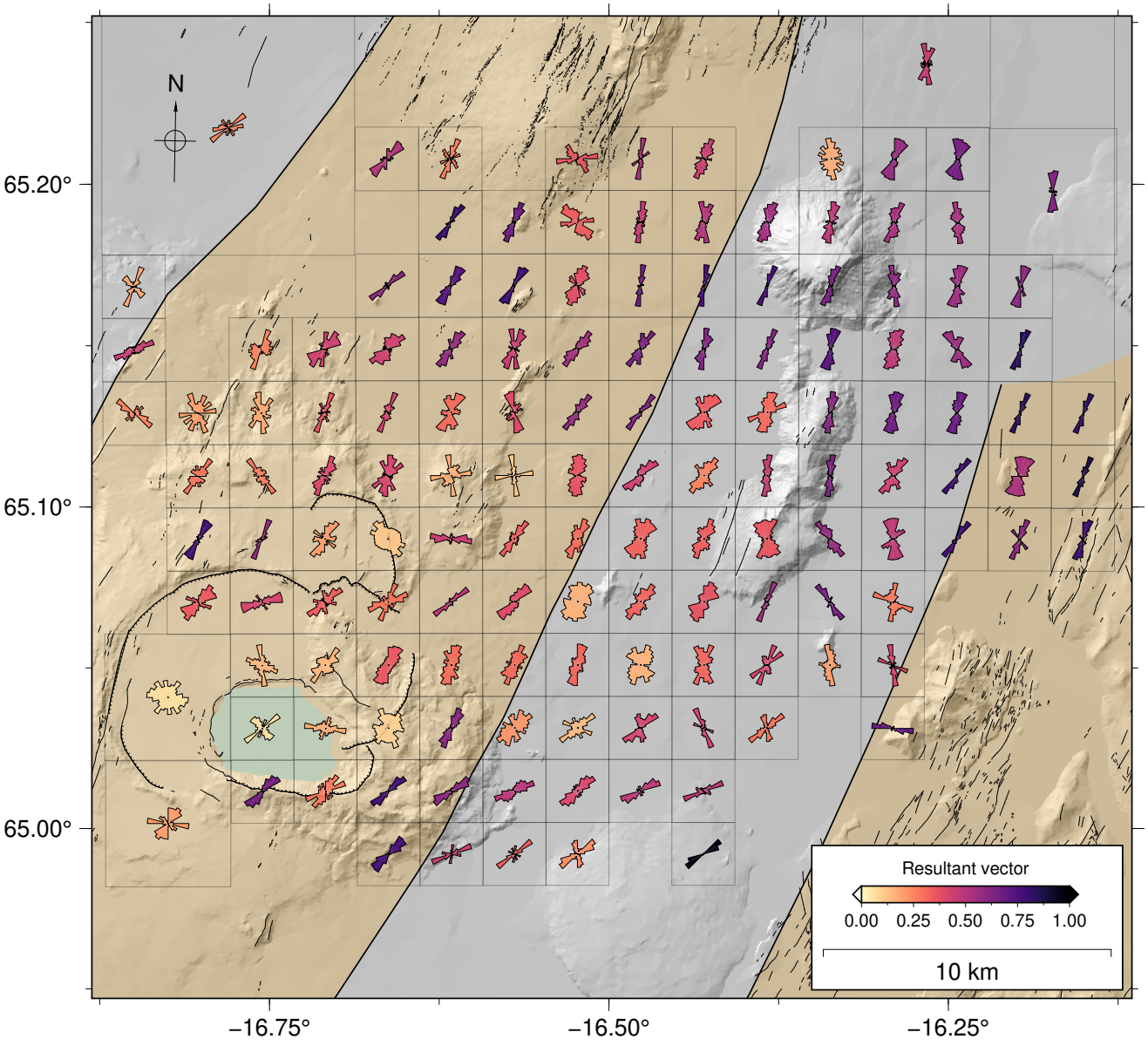

Figure S7. Lateral variations in observed fast axis orientations, ϕ. The observations have been assigned to the midpoint between source and receiver, then re-gridded using a quadtree method. The resultant grid is plotted using faint black lines. Within each cell, the rose diagram shows the distribution of fast axis orientation measurements, colored by the 'resultant vector' which is a measure of dispersion/coherence of the orientation data. Darker colors indicate stronger coherence.