*Geochemistry, Geophysics, Geosystems*

Supporting Information for

# Seismicity of the incoming plate and forearc near the Mariana Trench recorded by ocean bottom seismographs

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## Introduction

The supporting information includes additional figures and a table related to the earthquake study. We include a figure to demonstrate earthquake location uncertainties due to the velocity structure, a frequency-magnitude plot of all earthquakes in the study, and an example solution of a focal mechanism determined using first motion polarities. The included table summarizes the velocity models used for focal mechanism determination by regional waveform inversion.

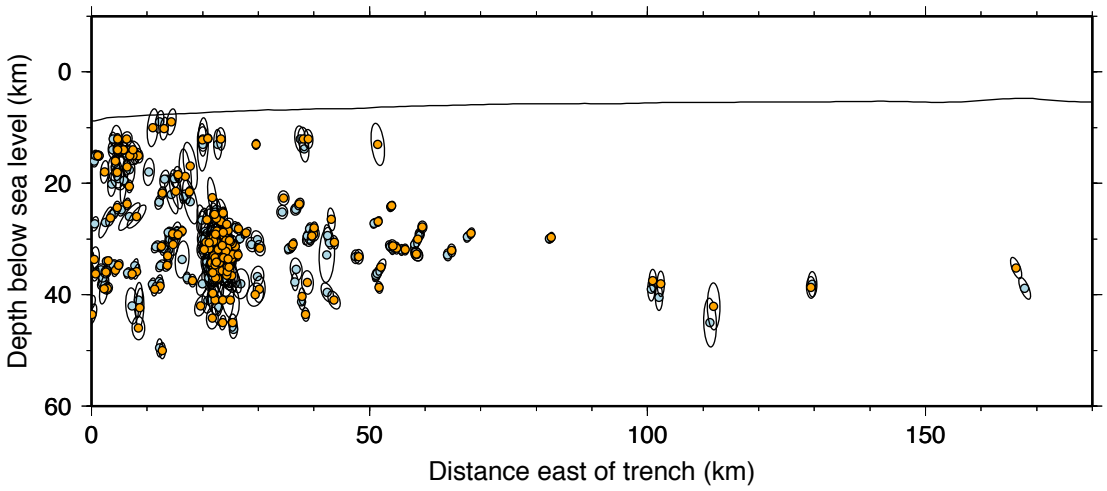


**Figure S1.** Earthquake locations with 95% confidence intervals for a subset of events between July 2012 and Dec 2012 on the incoming plate. Blue circles show locations for the final velocity model used, where Vp = 1.36 Vs + 1.90. Plotted over with orange circles are locations using a velocity model with a different Vp/Vs ratio (Vp = 1.37 Vs + 2.02) to demonstrate uncertainties related to the velocity structure used.

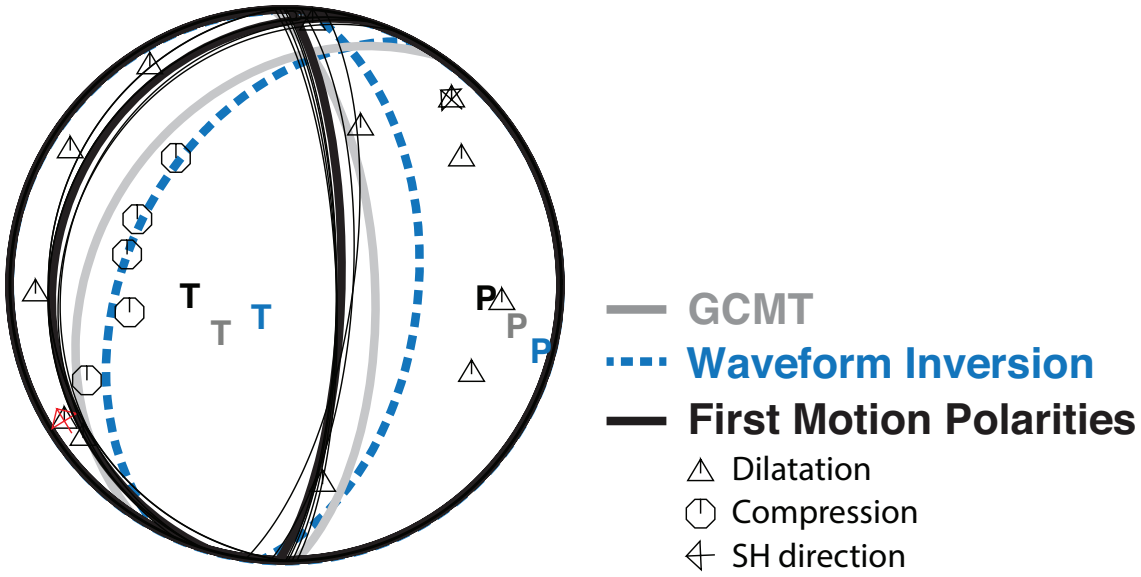


**Figure S2.** Results from the first motion polarity focal mechanism determination for the May 20, 2012 earthquake at 17.0 °N and 147.6 °E. All first motion polarity picks used are shown, using the convention of Snoke (2003). All possible solutions allowing for 1 error in SH polarity (marked red) are shown by thin black lines. The averaged solution is the thick black line, the solution determined by waveform inversion as in Figure 2 is in dashed blue, and the GCMT catalog solution is in grey (Dziewonski et al., 1981; Ekström et al., 2012).

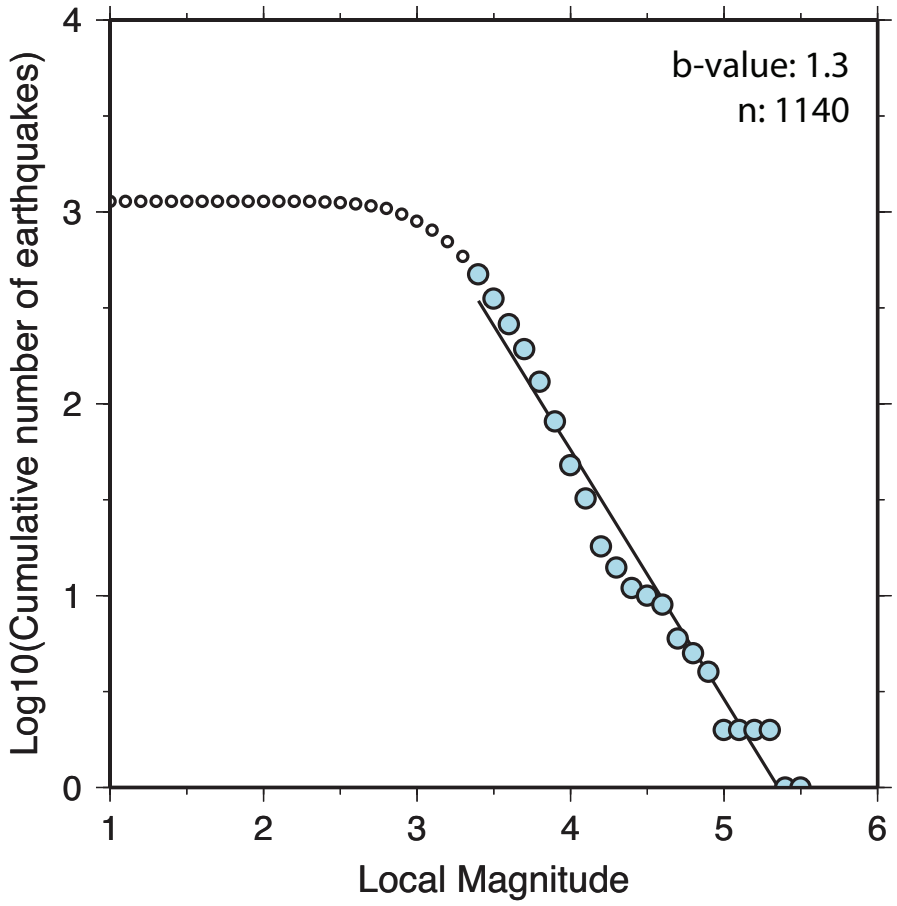


**Figure S3.** Frequency-magnitude plot of all earthquakes in the study for which magnitude could be determined. Magnitude of completeness is $M_L$ 3.4, n is the total number of events plotted, and blue circles indicate data used to calculate b-value by linear regression.

| **Forearc Model** | | | |
|---|---|---|---|
| **Depth (km)** | **Vp (km/s)** | **Vsv (km/s)** | **Vsh (km/s)** |
| 2.0 | 1.5 | 0.0 | 0.0 |
| 3.5 | 2.1 | 1.0 | 1.0 |
| 4.5 | 4.6 | 2.6 | 2.6 |
| 7.5 | 5.5 | 2.9 | 2.9 |
| 9.5 | 6.5 | 3.5 | 3.5 |
| 11.5 | 6.8 | 3.7 | 3.7 |
| 21.5 | 7.4 | 4.1 | 4.2 |
| > 21.5 | 7.9 | 4.5 | 4.6 |
| **Pacific Plate Model** | | | |
| **Depth (km)** | **Vp (km/s)** | **Vsv (km/s)** | **Vsh (km/s)** |
| 5.6 | 1.5 | 0.0 | 0.0 |
| 6.1 | 2.1 | 1.0 | 1.0 |
| 7.1 | 4.6 | 2.55 | 2.55 |
| 8.6 | 5.5 | 3.1 | 3.1 |
| 13.6 | 6.8 | 3.88 | 3.88 |
| 23.6 | 7.95 | 4.5 | 4.64 |
| > 23.6 | 8.1 | 4.7 | 4.84 |

**Table S1.** Velocity structure used for instruments on the forearc and incoming plate, used in the regional waveform inversion. The structure is given in uniform layers, with the depth column denoting the depth below sea level of the bottom of the layer.