

Supplementary Material for "Tracking Very Low Frequency Earthquakes into Long Continuous Records : Application to the Southern Ryukyu Subduction Zone"

Martin Vallée *, Tanguy Delaporte ¹

¹Université Paris Cité, Institut de physique du globe de Paris, CNRS, Paris, France

S1 Contents of this document

This supplemental material provides two additional figures (Figures [S1](#) and [S2](#)) that were mentioned in the main text in sections 5.1 and 5.3, respectively. Figure [S1](#) further documents the relatively small differences in the source parameters between the VLFE_DRL events and the associated events of the reviewed ISC catalog. Figure [S2](#) illustrates how a large VLFE can generate detectable high-frequency signals when recorded at close distances. Such large VLFES can then be missed if not jointly analyzing the low-frequency part of their waveform spectra. This may explain why the large VLFE shown in Figure [S2](#), as well as other large magnitude VLFES, are not present in the catalogs of [Ando et al. \(2012\)](#) and [Nakamura and Sunagawa \(2015\)](#).

Additionally, we provide below the captions of Tables S1 and S2 (mentioned in section 5.2), which are uploaded separately.

Table S1. Origin time, latitude, longitude and M_w magnitude of the 119 very low frequency earthquakes detected and located in zone A.

Table S2. Origin time, latitude, longitude and M_w magnitude of the 42 very low frequency earthquakes detected and located in zone B.

*Corresponding author: vallee@ipgp.fr

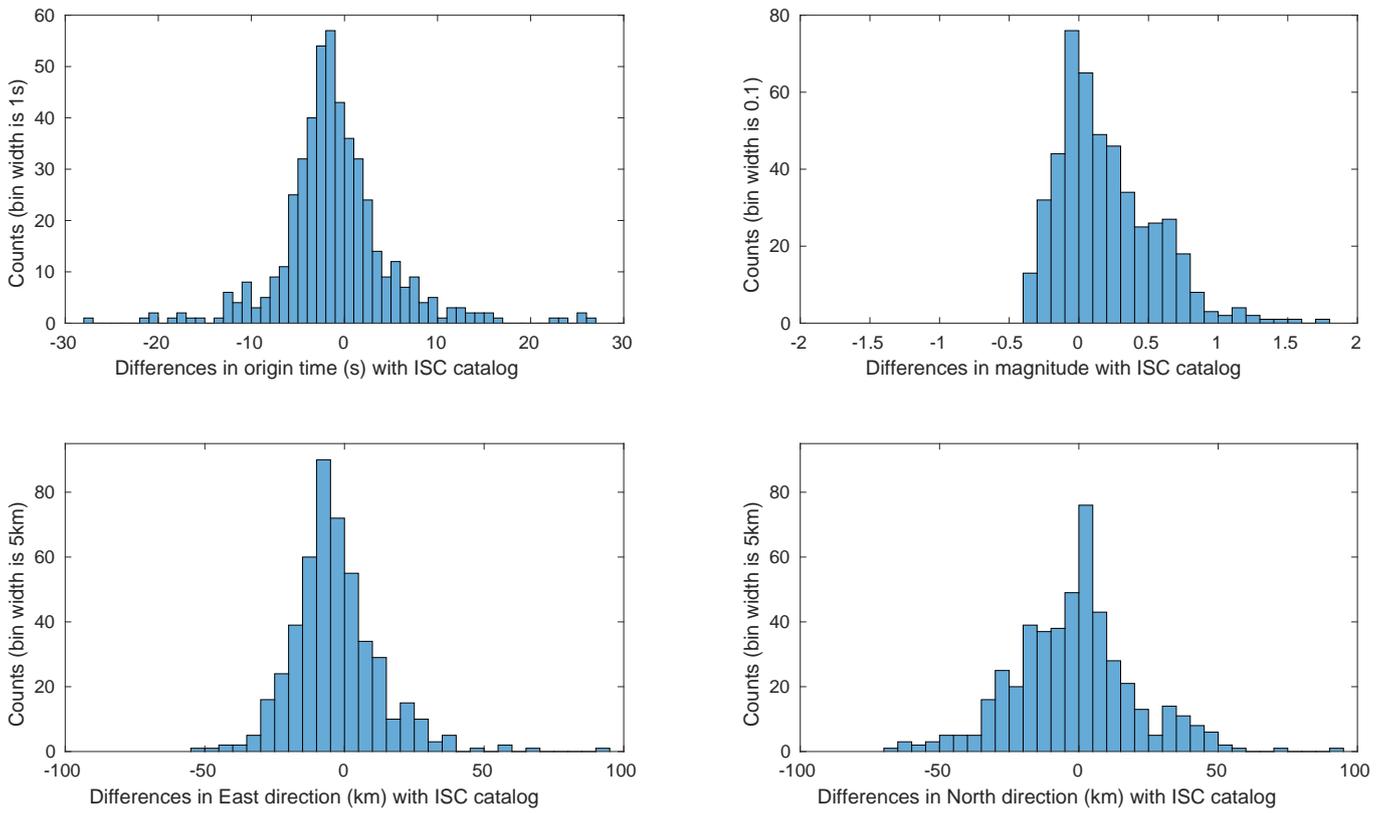


Figure S1 Histograms of source parameter differences between VLFE_DRL events and associated events of the reviewed ISC catalog. Top left: Origin time. Top right: Magnitude. Bottom: East direction (left) and North direction (right). Note that the selected ISC magnitude is the first one of the list provided for each event. Its type differs from event to event (mb, ML, M) and differences are thus expected with the VLFE_DRL M_w magnitude.

VLFE, 2007/01/18

EARTHQUAKE, 2020/03/30

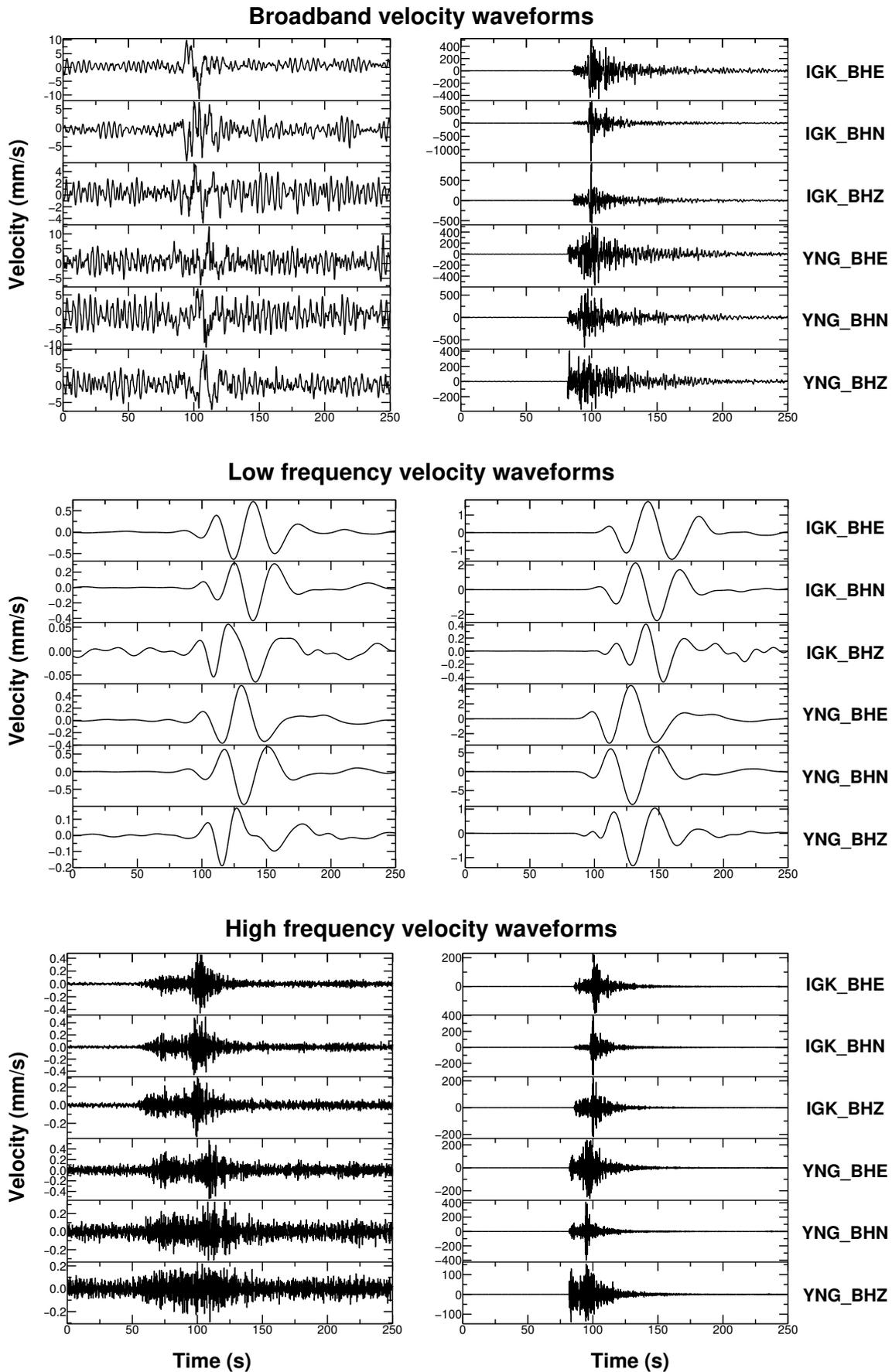


Figure S2 Caption next page

(Previous page.) Waveform comparison between a VLFE and a standard earthquake recorded at close distances by the F-Net network (National Research Institute for Earth Science and Disaster Resilience, 2019). The left column of the figure corresponds to the $M_w=5.01$ VLFE occurring on 2007/01/18T18:20:39 (see Table S1). The right column of the figure corresponds to the standard earthquake chosen as Template 1 in the main manuscript (2020/03/30T15:52:49, $M_w=5.38$). IGK and YNG stations are located at 109km and 121km from the VLFE, respectively, and at 110km and 82km from the standard earthquake, respectively (see also Figure 7). After correction from the instrumental response, the 3 components of the 2 stations (indicated to the right) are shown in three frequency bands. Top row: broadband velocity records [0.001-6Hz]. Middle row : low frequency velocity records [0.0125-0.03Hz]. Bottom row : high frequency velocity records [2-4Hz]. The VLFE character is clear on the broadband velocity records. In the low frequency records, the VLFE amplitudes are within one order of magnitude of the ones of the standard earthquake. In the high frequency records, signals are above the noise for the VLFE. However, their amplitudes are about 3 orders of magnitude smaller than the ones of the standard earthquake.

References

- Ando, M., Tu, Y., Kumagai, H., Yamanaka, Y., and Lin, C.-H. Very low frequency earthquakes along the Ryukyu subduction zone. *Geophysical Research Letters*, 39(4), 2012. doi: <https://doi.org/10.1029/2011GL050559>.
- Nakamura, M. and Sunagawa, N. Activation of very low frequency earthquakes by slow slip events in the Ryukyu Trench. *Geophysical Research Letters*, 42(4):1076–1082, 2015. doi: <https://doi.org/10.1002/2014GL062929>.
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