

## Reviewer #1

The authors addressed all of my comments, thus, I have no hesitation to accept the manuscript after a couple of minor corrections:

1. The authors should refer to specific figures in the supplementary material within the manuscript and not just state "Additional synthetic tests are provided in the supplementary material". I would appreciate a couple of words on the overall findings from the synthetic test.
2. lines. 331-332: Indeed, the algorithm is fast when using one data per channel. What does "one data per channel" mean? Please correct this.
3. It would help if the authors could increase the font size in their figures.

## Reviewer #2

It is not appropriate to test the algorithm with a homogeneous velocity model, especially for real data. At a minimum, a 1-D layered model should be applied, or the limitations of the homogeneous assumption should be explicitly discussed.

Line 44: The authors list "deep oceans" as an example, but Klassen et al., 2023 is an application in a glacial environment, not in deep oceans. The reference list of this paragraph is still weak. Some foundational papers (e.g., Lindsey 2017, Jousset 2018, etc) were missing. These Klaasen papers represent follow-up case studies rather than major methodological contributions,

Line 52: The phrase "unidentified or meaningless data" is vague. Please define precisely what you mean, e.g., do you refer to noise transients or spurious STA/LTA triggers

Equation 1: You use the power to calculate the dB value, but the correct definition is  $10 \log_{10}()$ , not  $20 \log_{10}()$ . Also, the notation  $(xxx, 0, 1)$  does not make sense mathematically. Are you trying to denote  $\text{clip}(xxx, 0, 1)$ ? Also, since  $\text{SNR}_i$  is already normalized, its values should naturally lie between 0 and 1. Please clarify why additional clipping is needed.

Line 109: Please add clarification, e.g., "For the observed earthquakes, the P-wave differential times were measured via cross-correlation, whereas for synthetic data they were calculated directly from theoretical traveltimes."

Line 110: "whose length is tailored to each specific event." What do you mean by this?

Line119-120: “ $CC_{i,j}(k)$  is then normalized to the product of the norms of  $U_i$  and  $U_j$ , thus providing a value of 1 for autocorrelation.” Can the authors simply incorporate this into equation 2?

Line 122: “Here, 0 represents the minimum correlation” The correlation can be negative.

Line 161:  $\text{diag}(W)$  gives you a vector,  $10^{(-ws)}$  gives you a scalar, please reformulate to avoid a mix of vector with scalar

Line 215: Supp Tables 6 & 7: Why negative values are allowed for  $H_3$  and  $H_5$ , if  $H_3$  and  $H_5$  are negative, this would promote the effect of the bad data points in your equation 5.

Equations 6&7, the reuse of  $H_2$  for SNR and MCC is still confusing, I understand they may be the same thing in your code, I suggest you change them to  $H_2, \text{SNR}$ , and  $H_2, \text{MCC}$ .

Equation 7: Could the authors explain why MCC and INTER\_DIST are treated as separate hyperparameters? Both carry similar information, since correlation typically decays with distance. The authors also note the potential trade-offs between these two hyperparameters.

Line 224: How do hyperparameters have ‘true’ values?

Fig 6&7A: The meaning of the circle and the colorbar is unclear. Why does the PPD within the circle appear uniform?

Line 238, I don’t understand the rationale for using only 200 channels in the synthetic test. Computational cost is not a convincing justification here. In a synthetic setting, full-array testing is straightforward and would demonstrate robustness. Moreover, for real data, how should one decide which narrow section of the DAS array to select for differential P times? Please provide a methodological criterion.

Line 272-272: Please simply give some numbers to indicate the improvement.