References to figure numbers in the reply are related to the originally submitted manuscript. Since figures had been added to the modified manuscript, figure numbers are changed accordingly.

>General Comments

>...

>The Empirical Green Functions (EGF) in Figure 2 are very symmetrical. So, it looks like the
>acausal and causal parts are stacked up, right? Or, which part of the EGF was used to calculate
>dispersion curves?

Yes, the Fig 2 IS symmetric, since we show cross correlations of ALL stations against ALL stations! To show that the individual correlations are indeed non-symmetrical, we modified Fig 2 by adding a single virtual shot gather, which clearly shows the asymmetry between causal/acausal phases. We modified Fig. 2.

>A noise directionality analysis (e.g., beamforming) would improve the understanding of the noise
>sources that contribute to the emergence of EGF. 10 days of continuous noise is enough to extract
>the FGE robustly?

We added a new figure showing the frequency and time dependence and the directionality of the noise sources.

We are aware of the fact that the 10 days of noise observation are quite short. Judging exclusively from the appearance of the dispersion curve of a single cross correlation trace, even with relatively short noise observations, dispersion curves (or part of them) can be picked quickly at frequencies dominating the noise. “Adding” more noise records (more observation days) “extends” the frequency range where reliable dispersion curve picking is possible. (our experience from other data sets).

>According to the authors, dispersion curves were estimated using the software of Ryberg et al.,
>2021a. The authors should explain any difference in obtaining the dispersion curve when using the
>acausal or causal parts of EGFs or indicate the validity of using the stack of both sides.

For picking a dispersion curve we used the single-sided part of the EGF. Picking a potential dispersion curve was done the following way: If there was a clear arrival at the frequency of with the highest noise energy (typically between 2-5 Hz) we started picking from that point “extending” the dispersion curve to higher and lower frequency as long as we could observe coherent (continuously connected branch of the dispersion curve). If such a starting point was not present, we did not pick any dispersion curve. The manuscript was modified to make this approach more clear.

>Figure 3 shows an erratic dispersion curve with values between 1.5 and 2.0 km / s. I consider all
>dispersion curves should be displayed and discuss the bandwidth filter effect of the filter.

Given the huge number of dispersion curves, we decided to show only a few examples. The effect of the filter bandwidth effect has been studied intensively and published. We used the values of 0.25

and 3.15 for band and beta (Dziewonski et al., 1969), representing the classical compromise between frequency and time resolution). We used the instantaneous frequency instead of nominal filter frequency to avoid strong “frequency” leakage. We modified Fig. 3 and extended the manuscript accordingly.

>The authors indicate that they resolved 30 frequencies between 1.2 and 20 Hz; if so, it is necessary >to show the number of velocity values (or arrival times) resolved in each frequency.

Fig. 5 (top) already shows the number of picks (==velocity values) for every frequency!

>How did they go from group velocity to phase velocity to get a Vs model?

We did not use phase velocities for inversion! Only group velocity picks contributed to the inversion.

>Since the 3D inversion model shows a series of contacts with significant velocity (or resistivity) >contrasts, as indicated by the sections in Figure 10, it is rare that the EGFs in Figure 2 are so >uniform and do not present some discussion indicating a change in velocity. Consequently, the >authors should show some virtual source gathers produced along with the seismic stations that >coincide with Figure 10a sections. These sections let to see that the correlations capture these >property contrasts.

You observation is right, the example dispersion curve is rather “smooth”. We modified Fig. 2 by adding a trace/dispersion curve for a station pair crossing one of the recovered strong (low) velocity anomaly. There the dispersion curve, being continuous (see picking procedure described above), shows a highly dispersive surface wave trace.