

Interactive comment on “Developing the hertz art-science project to allow inaudible sounds of the Earth and Cosmos to be experienced” by Graeme J. Marlton and Juliet Robson

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Reviewer 3: We thank the Referee for their comments and have responded below.

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"The manuscript outlines the development and presentation of an installation artwork, the goal of which was to enable infrasound from various sources to be experienced in tactile and audible ways but the general public. Marlton and Robson focus their discussion on the process of their collaboration, from the first trials of software and hardware

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for the installation work, through to the public reception and tour of the project and its reception by several audiences in a variety of venues. Moreover, the presentation of processed infrasound in real time in touring locations of the project provides a tangible and immediate connection for the audience. Inaudible and unseen aspects of our planetary environment, in effect, become 'real' and provoke both emotional and intellectual responses from the public, and often, a desire to learn more. This is an admirable and positive outcome to the project, and entirely relevant to the goals of Geoscience Communication. Moreover, the attention paid by the authors to the process of their constructive art-science collaboration is particularly relevant to the mission of Geoscience Communication, as it provides insights into the benefits and difficulties of such work for others interested in projects of this type. This paper would benefit from a thorough proofreading for minor typos and some awkwardness in phrasing but is generally readable and provides a solid overview of project development and the incorporation of feedback from public presentations."

We will thoroughly proofread through the revised manuscript.

"Further, I feel the inclusion of more detailed information regarding the specifics of presenting the project is warranted. For example, it would be useful to know the volume(dB) at which the processed infrasound was presented; this is relevant both in terms of some of the negative responses (one of which was "scary," as conveyed by the authors), and in relation to the aspect of inclusivity/accessible design mentioned in the paper. It would be both instructive to those wishing to pursue a similar project, and informative to those seeking more detail with respect to accessibility - or simply practical considerations of venue - to include the details of all the hardware, software, and specifics (such as volume, mentioned above) in the paper, or in an appendix to it."

A technical appendix will be added to the revised manuscript detailing the amplitude of the processed infrasound and some of the filter coefficients used. More information can be added about the hardware used. I would like to see more space devoted to the issues around accessible design overall, as this aspect of the project sets it

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apart from many art-science collaborations, and raises very important considerations in the transmission of both scientific and artistic/aesthetic information. Considerations around who our audiences are, and what are appropriate means of conveying ideas and information to them should be a first priority in this type of work, if we are to make inroads in communicating the relevance of both science and art to a wide audience. I commend the authors for raising this issue – but feel they could have addressed it more thoroughly, especially in relation to the user experience in the installation."

We will be including at the end of section 3 more information about how the science is conveyed at each venue and the setup of the exhibit. In this section we will also discuss the disability access incorporated into the project and the motivations behind it.

"It would also be of benefit to contextualize the project further; framing hertz in relation to both research in infrasound and in the context of contemporary sound art would allow readers to better situate the project's relevance to developments in both disciplines, and highlight the benefits of such collaborations. Examples of this work may be found at: Gupfinger, Ogawa, Sommerer, and Mignonneau (2009), Esquerro and Simon (2019), Sussman (2012), Hope (2009), Cranshaw (2014). In addition, there are other artists working with chladni plates; referencing their work would also assist in contextualizing the is aspect of the project, and strengthen the case for the relevance of this portion of the project here, and in future articles."

The introduction section will be modified to contextualise the project further with references drawn from artists working with both chladni patterns and infrasound previous to the project and those discovered during the research phase while the project was ongoing. In addition to this references to other pieces which have made similar use a geophysical data and those mentioned by the reviewer above will be used in the introduction section to better seat the project in a broader context in the art-science world.

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"I commend the authors for including commentary on their own experiences of working collaboratively, across disciplines. This is challenging work, and can only be truly successful if everyone involved approaches the work with openness, and a desire to learn and work in new ways. There is tremendous value in this approach to the explication of both complex scientific concepts and artistic creation alike, and much to be learned on both 'sides.'

Specific comments related to the above are listed by line number here:

Line 93 The relationship (if any) between the data collected by the CTBTO and the data collected through the INFRA 20 is not clearly stated here."

The mention of the CTBTO was to give a broader context to why infrasound data was recorded originally and data from the CTBTO was not explicitly used in the artwork. The revised manuscript will be amended to clarify this.

"Line 65 Although you are not detailing this part of the project here, it is part of your documentation of installations, and the statistics on visitor interaction with the works (Page 8, line 250). As such, would be useful to readers to cite and/or refer to work in cymatics, perhaps in particular reference to contemporary art, to further explicate the notion of making the invisible visible. The work of both Nigel Stanford and Gary James Joynes come to mind."

As discussed above we plan to contextualise and sit the project in a broader context with references to other artists in the introduction in the revised manuscript

"Line 120 -121 Could the sound emitted form the subwoofer also be felt physically? Worth noting one way or the other, as the secondary physical impact of the sound would contribute to the immersive quality. This seems to be the case given what you say in the next sentence about playing Dark Side of the Moon through the subwoofer & transducer in the first trial, and with respect to the subwoofer in the public iterations of the project. More detailed specifications for the subwoofer and transducer, and dB

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for both initial test and subsequent installations would be extremely helpful."

Yes the sound from the subwoofer could be felt physically. The dB was never explicitly measured nor calculated. The information about the power of the subwoofer and transducer will give some indicator to the loudness. It should be further noted that volume levels were shifted from install site to install site.

"Line 160 You could make more of the immediacy of the experience - it is an important factor in work of this nature that strives to connect people both emotionally and intellectually to natural phenomena such as this. This experience cannot be duplicated on the web, and cannot be simply listened to or watched: it needed people to be physically present. This becomes even more relevant in later iterations of the work, in which you draw on infrasound from the locations of presentation, where place and the experience of the work are inextricably linked."

We will make this aspect more explicit in the revised manuscript. By reaffirming that in order to experience it truly one had to visit the exhibit and that even processed infrasound data that had a higher threshold so it could be listened to through standard audio equipment did not do the project justice

"Line 170 Was there feedback from the participants that was negative? Given the range of abilities in the audience for this, some may have had a negative experience; it would be useful to know this, what those less-positive responses were, and how they were factored in to further development of the project. For example, for some individuals with chronic pain and/or migraine and/or disabilities that affect balance, this installation may have been difficult to engage with, depending upon the volume or level of vibration physically experienced."

Section 3 will be modified to describe more fully the integration of accessibility into the design of hertz as well as feedback from those who experience accessibility challenges. Visually impaired and deaf visitors (figure 6 of the manuscript) at the "Be There At the Start" conference found it easy to interact with the project. While there were a

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wide range of people with different disabilities at the conference, many of which experienced the infrasound of Leicester through the prototype of hertz there was no negative feedback in terms of discomfort. Robson experiences chronic pain and had found no ill effects, some vibrations were soothing and some intense but did not exacerbate her chronic pain.

"References Cited above: Gupfinger, Reinhard & Ogawa, Hideaki & Sommerer, Christa & Mignonneau, Laurent.(2009). INTERACTIVE INFRASONIC ENVIRONMENT: A New Type of Sound Installation for Controlling Infrasound.

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Nigel Stanford. https://nigelstanford.com/Cymatics/Behind_the_Scenes.aspx Gary James Jones. http://www.clinkersound.com/frequency-painting/?page_id=347

Please also note the supplement to this comment: <https://www.geosci-commun-discuss.net/gc-2020-9/gc-2020-9-RC3-supplement.pdf> Interactive comment on Geosci. Commun. Discuss., <https://doi.org/10.5194/gc-2020-9>, 2020. C5

Interactive comment on Geosci. Commun. Discuss., <https://doi.org/10.5194/gc-2020-9>, 2020.

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