

# ***Interactive comment on “Modal sensitivity of rock glaciers to elastic changes from spectral seismic noise monitoring and modeling” by Antoine Guillemot et al.***

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Reply to reviews on the manuscript Modal sensitivity of rock glaciers to elastic changes from spectral seismic noise monitoring and modeling

By Antoine Guillemot, Laurent Baillet, Stéphane Garambois, Xavier Bodin, Agnès Helmstetter, Raphaël Mayoraz, Eric Larose

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Dear reviewer, dear editor,

We would like to thank you for the constructive review following the submission of our manuscript “Modal sensitivity of rock glaciers to elastic changes from spectral seismic noise monitoring and modeling” to The Cryosphere. We took into account all the comments from the two reviewers and editor. One of the main problems raised concerns the lack of references to the HSVR method. Indeed, we didn't specified clearly that our seismometers are single (vertical) component, so that the HSVR method was inapplicable in our case. However, we added some mentions to previous publications on this method successfully applied on permafrost, since the methodology is very similar to spectral analysis presented in this article. Furthermore, you suggested additional figures to demonstrate the feasibility of our method: one showing the temporal evolution of modeled resonance frequencies, and another one showing modeled amplitude of the spectrum for a particular state of freezing. Unfortunately, both of them are difficult to address accurately to our mind, because of the lack of information concerning thermo-mechanical coupling and 3D effects on the rock glaciers. We detail these points further in our response. As suggested by the reviewers, we also modified some sentences and figures in order to improve both the quality of information that we provide and the readability of the publication. We added also some references to publications about seismic monitoring on permafrost and glaciers, as a completed state of art. Please find below a point-by-point response to all your major comments (our answers in red), in complement to the new manuscript with highlighted main changes (text in red as well).

Sincerely yours,

On behalf of the authors,

Antoine Guillemot

Please also note the supplement to this comment:

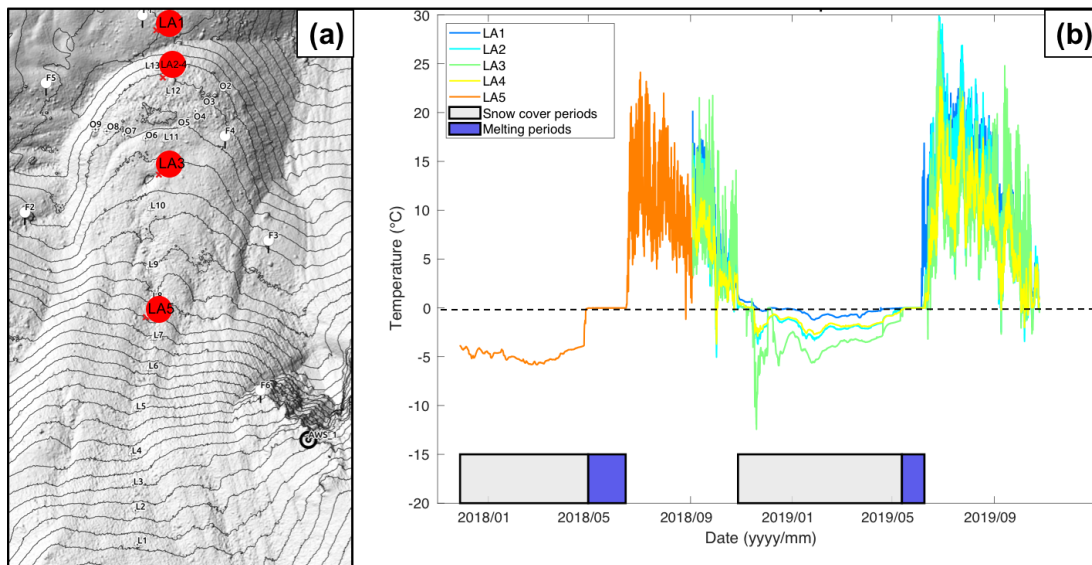
<https://tc.copernicus.org/preprints/tc-2020-195/tc-2020-195-AC1-supplement.pdf>

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2020-195>, 2020.

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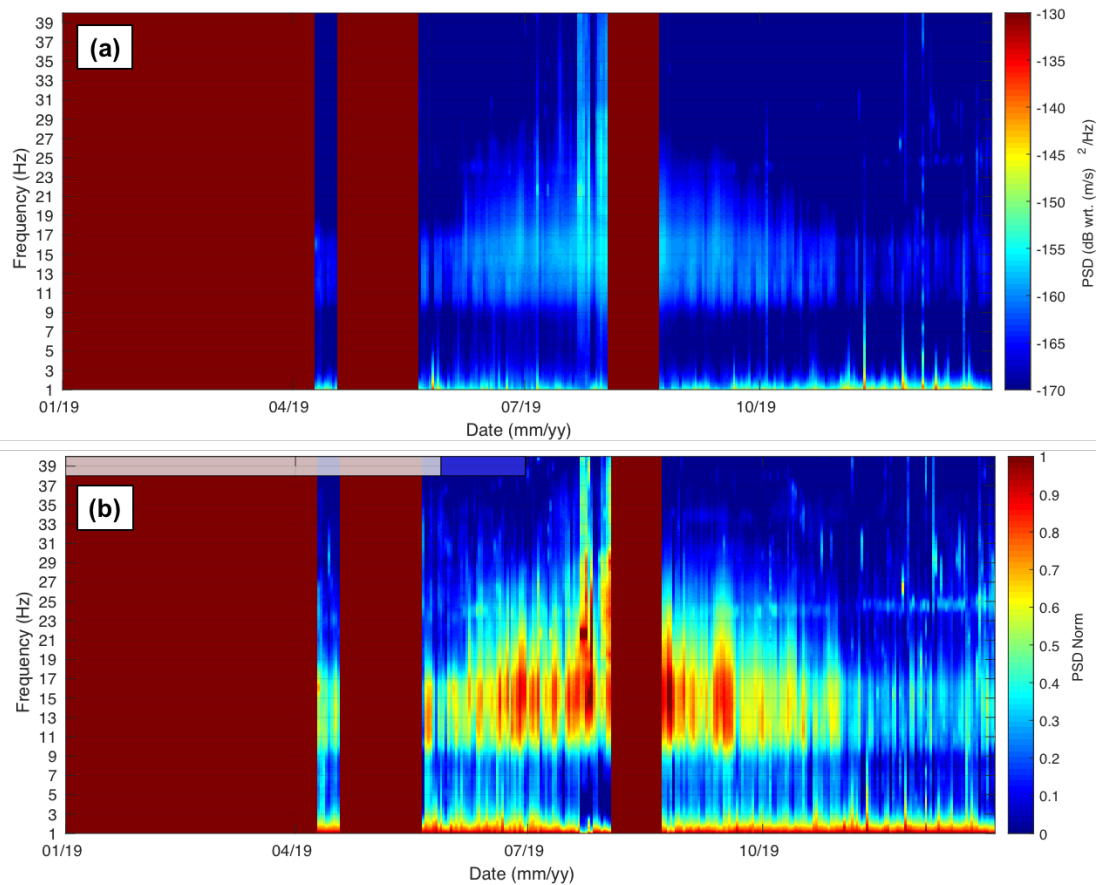
Discussion paper



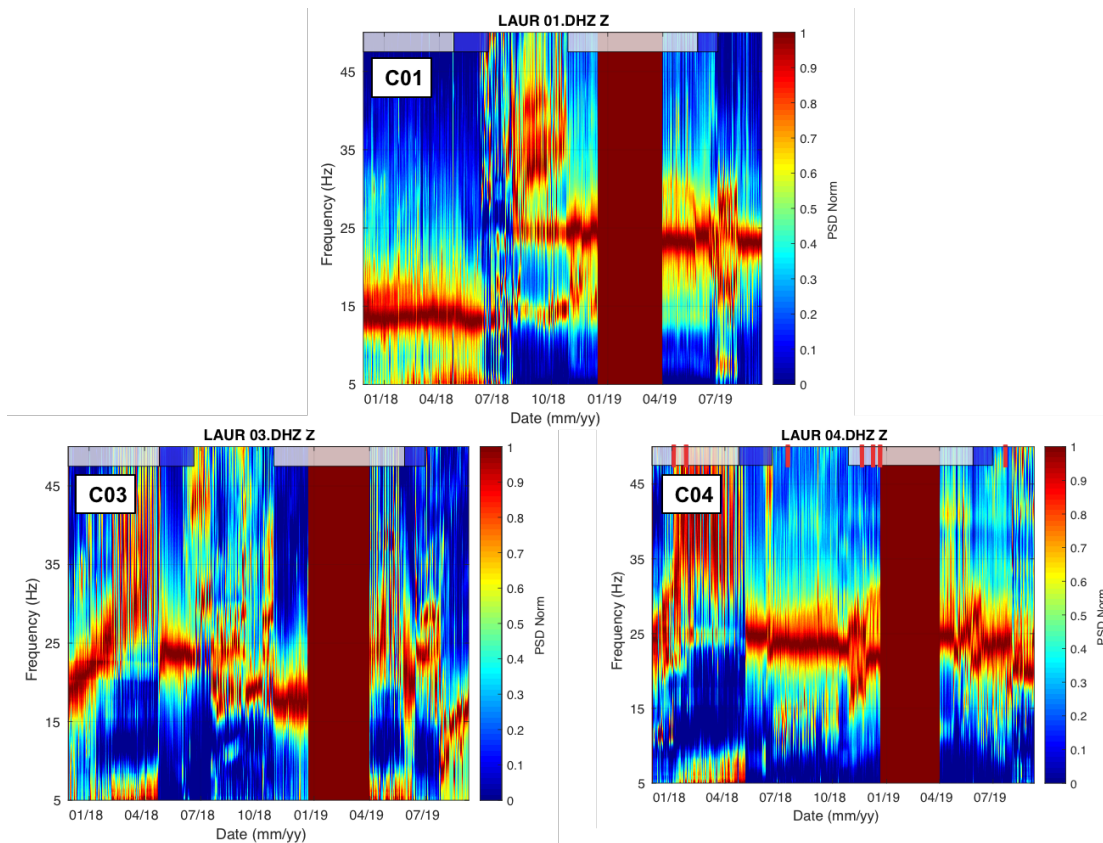


**Fig. 1.** Figure 16 : (a) Location of the five Miniature Temperature Dataloggers (MTD) that record every hour the temperature of the sub-surface (below 2-10 cm of debris), and (b) the corresponding measurements

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**Fig. 2.** Figure 19 : Daily raw (a) and normalized (b) spectrograms of Power Spectral Density (PSD) from OGSA station, located at 2 km from the Laurichard rock glacier, in a stable site, for all the year 2019.



**Fig. 3.** Figure showing normalized spectrograms of other sensors in Laurichard rock glacier, even if data quality is low.

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