



# ***Interactive comment on “A climate index for the Newfoundland and Labrador shelf” by Frédéric Cyr and Peter S. Galbraith***

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Received and published: 16 March 2021

Dear Reviewer, Thank you for your comments. Please find below a point-by-point reply to your comments. In order to better answer, the relevant part of your comments associated to our answer has been re-copied here in italic

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*This study introduces a new index to represent environmental conditions of the Newfoundland and Labrador Shelf. The new index is based on 10 subindices. Having a useful index that can well depict variations of the environmental conditions is always useful and needed. The paper is well written, but I do have some questions.*

(1) The winter NAO index is generally believed to have significant impacts on the hydrology in the subpolar region, but the correlations shown in Figure 13 suggest that the NAO does not strongly contribute to the variations of the other 9 sub-indices. I would tend to suggest the authors provide some explanation for this.

We see this lack of strong correlation as rather a good thing. It means that the NLCI captures a more complex dynamics that is not entirely captured by the NAO alone. While the winter NAO captures some decadal dynamics (warm 60's, cold 90's; warm 2010's, etc.), the year-to-year correlation between all subindices is likely weaker because of lag/inertia effects. We now discuss this near L.250.

(2) Salinity from S27 appears not to be a good index to use for representing the environmental conditions of the investigated shelf waters (Figure 13). Considering the location of the station which is close to coast (by visual judgement), other factors may have contributed to its variability rather than environmental condition changes in the shelf waters as a whole. If this subindice is removed in the calculation for the new climate index, can the performance of the new index be improved?

Station 27 is located within the Avalon channel, which is one of the main pathways of Arctic-origin waters flowing along the Labrador coast. Previous studies have shown that the geographical location of the Station is very relevant for the NL shelf as a whole [e.g. Petrie et al.: Temperature and salinity variability on the eastern Newfoundland shelf: The annual harmonic, *Atmosphere-Ocean*, 29, 14–36, <https://doi.org/10.1080/07055900.1992.9649433>, 1991]. While the correlation between salinity and the NLCI is not significant, salinity has been related, for example, to capelin dynamics, although no clear causal effect has been established. We thus believe that it is important to keep salinity for

these reasons, but users can remove it from the NLCI since all subindices are provided. This is now explained in the Discussion L.260.

(3) *The S27 temperature and S27 CIL have a strong correlation, which is expected. They are not really independent with each other. I am not sure how this dependency can affect this new climate index. Can the authors address this issue?*

Yes, a large part of the Stn27 temperature is driven by the CIL temperature, but we have chosen to only consider the “core temperature” of the CIL (minimum temperature of the profile) for which the correlation is 0.72. This signifies part of the variance in one is not captured by the other. The vertically averaged temperature at Station 27 also includes surface and bottom temperature that are not always in phase with the CIL core temperature.

(4) *Since this new climate index is intended to replace the CEI by Petrie et al. (2007), it would be helpful if the authors can provide some details about this CEI in the manuscript, which can make the paper complete.*

An historical review of previous studies presenting such climate index is now included in the Introduction. A table presenting an overview of these studies and its components is also provided (Table 1)

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Interactive comment

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Interactive comment on Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2020-350>, 2020.

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Discussion paper