



EGUsphere, referee comment RC4  
<https://doi.org/10.5194/egusphere-2022-151-RC4>, 2022  
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## **Comment on egusphere-2022-151**

Anonymous Referee #3

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Referee comment on "The modelled climatic response to the 18.6-year lunar nodal cycle and its role in decadal temperature trends" by Manoj Joshi et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-151-RC4>, 2022

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### **Review for "The modelled climatic response to the 18.6-year lunar nodal cycle and its role in decadal temperature trends" by Joshi et al.**

The authors examine the impact of lunar nodal cycle with a period 18.6 years on the Earth's climate. To do this, they use a relatively simple model with parametrized effects of the lunar nodal cycle. They show that there is a cyclic signal related to the lunar nodal cycle in global/regional air-temperature and in the mean sea level pressure, resembling the North Atlantic Oscillation (NAO). They also mention that global warming hiatus earlier this century may have been partly caused by this, and mention that similar events like this are expected in the future. While I find the topic interesting and I think effects like this should be explored further, I also think that the manuscript requires major revision before it can be published.

#### **Major comments:**

I think that discussion could be more thorough, i.e., results/discussion sections should be expanded.

- For example, how does lunar nodal cycle impact on global/regional mean temperature, NAO etc. compare with other processes that control decadal-multidecadal indices. Is it more or less important for climate system variability than other processes? Or perhaps the lunar nodal cycle is a cause for some of the variability? Maybe the different variabilities are out-of-phase and/or uncorrelated? Much like other comments I have seen, I agree that the results in this paper are overstated, also given the simplicity of the experiments.
  - In the Atlantic there is a 15–18-year cycle - see: Årthun, M., Wills, R. C. J., Johnson, H. L., Chafik, L., & Langehaug, H. R. (2021). Mechanisms of Decadal North Atlantic

Climate Variability and Implications for the Recent Cold Anomaly, *Journal of Climate*, 34(9), 3421-3439

- There are obviously also Pacific (inter-)Decadal variability, Atlantic Multidecadal variability, AMOC etc., which are briefly mentioned in the manuscript. See e.g.: Omrani, N.-E., et al., 2022: Coupled stratosphere-troposphere-Atlantic multidecadal oscillation and its importance for near-future climate projection. *npj Clim. Atmos. Sci.*, 5:59
- There are many more papers on the topic that could be further discussed.
- The authors state on l. 120, 125 there is insignificant response for everything, except maybe in MSLP in the Euro-Atlantic. How much variance in the NAO on this specific timescale does nodal cycle represent?
- L. 128-138: I think figures here need some uncertainty estimates. Also, I think this paragraph is overstated – other effects may be stronger than nodal cycle so I would like to caution against implying “nodal cycle will(has) cause(d) this”. While I agree that decadal-multidecadal variability can cause delays in or speed-up the global warming trends (and affect the onset of 1.5 degree warming) I think you must be careful if you are not sure how much other modes of variability will contribute and to what extent – different effects may cancel out and then the statements in this paragraph are less meaningful.
  - Fig. 10: I am not sure how you added nodal cycle in for bottom panel in Fig. 10. Did you run the model? Statistically? Please elaborate.
  - Also add uncertainty from climate models on top panel.

I think methods should be provided in more detail (use appendix if needed).

- I think that the authors have a control run, but it is never mentioned in the methods.
- On l. 55 they talk about 8 largest tidal constituents – since I am not a tidal expert I find this hard to follow – please elaborate what they are, their timescales, is lunar nodal cycle among them or do you impose it separately (this seems to be the case).
- On l. 65-70 you mention geographical shape of the function – is this based on observations? Which?
- Presumably tidal components are typically parametrized in models?
- On l. 71-77: authors talk about “SCALED” and “CONSTANT” model configurations and say that the former provides underestimations and the latter overestimation. Is there an ideal way of simulating this or are these methods commonly used – what have you simplified here?
- L. 79: how exactly is nodal cycle applied to the model? Please elaborate.

Figures should have better captions – more descriptive – half of the time I am left wondering what is actually plotted. I also think they should be revised.

- Fig. 2,3,4 it is really hard to see if something is out-of-phase/in-quadrature etc. if lines are plotted in different figures – I suggest plotting such lines together in one figure. Or provide more details – maybe Fig. references are incorrect in text or maybe you need to mention “middle panel in Fig. 3” etc.?
- l. 107-117: I cannot say I can follow the text here related to Figs. 5-6. I am not sure

- where you see out-of-phase relationship between Tsurf and global response (of what?).
- Fig. 7: Top panel does look NAO-like, but bottom panel reminds me more of blocking-like structure. Also, top panel shows perhaps some wave-trains in the Southern Hemisphere. I think this figure can be discussed more.
  - Many figures are present, but not discussed enough – either don't use them or discuss them in more detail.

Is there any observational support for the authors' claims? Even if it is just 20 years of data (i.e. 1 cycle)?

I agree with the authors' final statements that such effects (if they are as relevant as the authors claim) should be better represented in climate models.

### **Minor comments**

l. 17: O (0.1K) – are you trying to say that it is of order 0.1K? Then just spell it out.

l. 32: 3.7% and 11.5% - provide reference for the numbers.

l. 42, 174: OAGCM --> AOGCM (?)

l. 98, 99: Tg – is this supposed to be Tsurf? It is not defined anywhere.

l. 100-102: suddenly you talk about solar/volcanic forcing – where is this from??  
Reference figure/previous study.

l. 106: 'later' --> 'below' (?)

l.269: I think top and bottom panel description is reversed.

Fig. 2 caption: Provide units.

All Fig. captions: more details.