Review of: "Varying coefficients correlated velocity models in complex landscapes with boundaries applied to narwal responses to noise exposure"

AE report

In this nicely written manuscript, the authors present a new approach for constrained movement modeling. Specifically, their work in modeling narwals incorporates distance to shore as an effect on movement, and investigates how movement may change due to ambient noise. Two very knowledgeable referees provided thoughtful reviews of this work. While both were generally positive about its methodological contribution to the literature, some significant and legitimate criticisms were presented. I do think if these comments can be addressed through a substantial revision that AOAS would make for a nice outlet for this work. However, addressing the comments pertaining to the application and comparison to previous methods will take some heavy lifting, which may not be of interest to the authors at this point.

Below are a few comments/questions of my own.

- I understand that the contribution of this work is in employing the CTCS model to analyze GPS positioning of the narwals, which in turn helps to quantify the effects of sound exposure as a function of distance from shore. What isn't clear to me is what are the shortcomings of the previous work to this aim, and, more specifically, how can the benefits of the newly proposed approach be demonstrated.
- In this particular application, is the main challenge the irregular boundaries of fjords? I think some significant revisions are required for the introduction and/or the data section to depict the application in this analysis that is motivating this work. As one of the other reviewers mentions, it is critical to the readership of AOAS to show the data and clearly demonstrate why this application motivated the need for advanced statistical methods and models.
- It seems that the new methods for constrained animal movement models could/should be more broadly useful beyond just investigating sound exposure impacts on narwals. If the main methodological contribution is the developing of methods for constrained movement, this should be expanded upon to various application areas. I'm not saying fit the models to additional data but rather paint a bigger picture to the contributions here. For example, surely other animals have movement constraints. But what about fire? There has been quite a bit of work as of late for movement of fires so perhaps you could discuss this as well? Or others?
- Check your use of `\citep`. Lots of these should be `\cite`. E.g., Brillinger 2003 on page 2
- Page 2. Typo: Example models, not Examples models.
- Page 2. Typo: ... drift constrain, not constraints
- Page 3. Remove the bullet points and summarize in a paragraph the contribution of the work.
- Page 5. Why limit ship noise to only effect narwals in the line of sight? Couldn't you just keep it as the distance to ship, whether in front or behind, since this is argued to be more reasonable?

- Page 13. In the simulation, you change both the observation error (5 to 25) and the frequency of data collection (1 min to 5 min). Are you able to tease out which of these is impacting the results? I was interested in the time frequency aspect of this simulation specification but then it seemed most of the inferential impacts were attributed to the measurement error. Since measurement error likely needs to be assumed fixed/known, I'm not sure how much this adds to the simulation. Or, perhaps you could consider a 3rd case that keeps one of these fixed and only changes one?

- Page 13. I don't follow the rational of restricting trajectories to only those in the interval [1,5]. Wouldn't you be interested in a model that can be more generally flexible? Or perhaps I'm misunderstanding. Does a trajectory get retained if *at least* one observation is within the interval?