Associate Editor decision: Publish subject to minor revisions (review by editor)
by Marilaure Grégoire
Comments to the author:
Dear Michaël Stukel and co-authors,

I have read the answers you provided to the comments of the two reviewers. I am satisfied with your answers but I found that, in some instances, the manuscript has not been modified to clarify reviewers' questions.

Thank you for this opportunity to revise our manuscript. We have made the suggested revisions as outlined below.

Also, before acceptance of your work I would like that you modify the manuscript to answer the following comments:

1) comment of reviewer #1 on the representativity error,

At lines 278 – 285 we have added the text:

"We note that observational uncertainty can result from both instrument error and representativity error, and while we explicitly incorporate instrument error, we do not directly include all sources of representativity error. Representativity error refers to error due to unresolved scales and processes, observation-operator error, and errors associated with pre-processing and quality control (Janjić et al., 2018). Since our data is derived from direct in situ measurements, the latter two sources of representativity error are likely much less significant than errors resulting from unresolved scales and processes. Because we incorporate the standard deviation of multiple measurements taken at different depths and sampling times within a model layer in our measurement uncertainty, we include this dominant source of representativity error."

2) comment of reviewer #1 on the detection limit,

At lines 264 – 267 we have added the following text:

"Detection limits varied depending on measurement type. In practice the actual value of $detlim_{i,j,k}$ was not very important to our results, because observations were seldom less than $detlim_{i,j,k}$. However, this formal definition is necessary with log-normally distributed errors, because occasionally the reported observational value was zero (or even negative)."

3) comment of reviewer #2 about the distribution of variables that have a probability peak at the limit of their allowable range.

At lines 348 – 353 we have added the text:

"We note that some well-constrained parameters were constrained by the data to fall within narrow bands near the middle of their prior allowable range (e.g.,$V_{max,SP}$, Fig. 3) and others were constrained to the edges of their allowable ranges (e.g., α_{SP}, Fig. 3). While the latter case shows sensitivity of our model to our chosen priors, we do not consider this a flaw. Instead, it demonstrates that the data is providing strong constraint on the possible values of these parameters and effectively providing guidance for constraining these parameters in future studies."

Many thanks for your efforts,

Kind regards,

Marilaure Grégoire, Associate editor.