2nd Review of Bounceur et al. (ESDD 4 901-943)

The authors have put forth a noticeable effort into the revision, and the paper is improved from its previous version. There are, however, still a few issues that arise in this revised version that need to be addressed before this article can be recommended for publication.

General comments

- On p.13, the use of $\Lambda_k = L$ and $\nu_k = \nu$ implies some advantages in the computations of V_i as you mentioned on p.15, but having independent fits would allow to easily parallelize your code. This means that for $n' = 10$ you might have the estimated values 10 times faster. Along the same lines, equations (16)-(20) (I believe (15) does not depend on k) can also be estimated in parallel for every combination (k, k^*), so provided that you can run this code on a workstation or on a cluster, I would argue that the independent estimation is computationally faster than to the joint estimation. A potential issue could arise if the fit is so fast that synchronization among processors might take longer than the actual fit (on p.16 l.7-9 you state that the computational time is affordable in both cases), so this could be a minor point. However, since you are discussing the computational cost of the emulator, you should at least contemplate the possibility of parallelizing the code.
- Section 2.4.3 still needs some work on notation, see specific comments.

Specific comments

- p.12 l.7 I believe you meant $\mathbf{h}(\mathbf{x})$ here. Also, one line below, it should be $\boldsymbol{\beta}$, not **beta**.
- p.13 l.19 $\Lambda_k = \Lambda$ is a cleaner notation.
- p.15 Since (15)-(19) are not essential, putting them into the appendix could make the reading easier. This could also give you more space to specify what $\mathbf{C}$ is (I believe you are referring to (9) here). In the manuscript, you could simply say that they are all (but $\mathcal{A}_i$) function of (k, k^*).
- p.16 10. About the computational advantages, it is worth mentioning that if you were to consider an independent emulator for each of the 2048 grid points, for some choices of $\mathbf{x}$, outputs such as temperature would likely not change so much in many locations, thus making it really hard to accurately estimate $(\Lambda_{(i,j)}, \nu_{(i,j)})$ for every grid point (i, j). So unless you postprocess

your parameter estimates with some spatial smoother, a global approach such as the one you propose is preferable.

- p.19 l.1. Should be "diagnostic".
- p.20 l.4. S_{tot} is with reference to (8). Pointing it out makes the reading smoother.
- Figure 4. In the first three columns, adding the estimated (asymptotic) uncertainty could help to see if the difference between parameter estimates is significant.