

# Response to Reviewer 1

May 19, 2024

## Overview

This work proposes a proxy system model, which incorporates both prior information and generalized noise in all variables. This can be useful for paleoclimate data assimilation. The results look reasonable. The reviewer suggests this paper can be accepted after some minor revisions.

Thankyou for your comments.

1. I recommend the author to restructure Section 2.1, the existing methods/theories should be distinguished from the proposed methodology. The increment unique to this work needs to be clear. I've split Sect 2.1 now into two sections (2.1 and 2.2), and added Table 2 to make the historic advances clear. Table 2 is discussed in the new text in Section 2.1.
2. Because this paper has many symbols, I suggest all the symbols like those around Line 60 should be documented in Table 1, rather than being described in the text near the equations. Table 1 now contains most of the notation, including table footnotes with some explanatory text. I occasionally give extra information in the text below an equation where I think necessary. I also update some of the notation e.g. for  $\theta$ ,  $\Theta$  and  $\phi$ ,  $\Phi$ .
3. On line 122, better use "Hadamard product" instead of "Hadamard multiplication". I've changed this. In the literature I do see Hadamard multiplication being used in an action word sense.
4. - Line 45, "exapands" → "expands"  
- Line 255, "incoporates" → "incorporates"  
Corrected, thanks!