Geoscientific
Model Development
Discussions

Interactive comment on "Optimization of experimental designs and model parameters exemplified by sedimentation in salt marshes" *by* J. Reimer et al.

Anonymous Referee #2

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This paper describes a Matlab toolbox for optimizing experimental design and is applied to two simple saltmarsh models. The paper is quite clear to follow and written in a very concise style that means key technical details are conveyed clearly. The paper clearly presents something that would be useful, however the wider context of the work and the conclusions is not discussed at all. I think the authors miss an opportunity in this regard.

Overall I have only a few specific points:

Abstract: The abstract is concise and get's to the point although perhaps a sentence to give a general geosciences context would help.

Introduction: Like the abstract this is concise, however a few key things are missing for me

1) What is the original contribution of the article? Given that there is no literature or context included in the introduction its difficult to know what this is. If the originality is the Matlab toolbox then some context is needed to explain what was available prior to this toolbox. 2) I would expect at least a few good examples of these methods being used in geosciences to be referenced. The start of the paper currently has no focus and reads more like an introductory textbook.

Section 2.1 P6443, L15: Sorry I don't understand what you mean by model parameters are assumed to be compact? Also, just below, I'm not familiar with the use of the term injective. Maybe these could be defined.

Section 2.2 "Provided certain regularity conditions are met" Could you explain what these are at some point for completeness? Section 2.5: Check English in sentence "if the parameters occur nonlinear in the model" -> if the model parameters are non-linear. P6451, Ll5: Is there a memory space issue with saving intermediate results. Actually more generally could you comment on the memory efficiency and what might be a limiting factor in the size of problem that can be handled? Section 4 P6454, L20: I think the example is from geosciences rather then geophysics. Also it's not clear what you mean by two models. . . I initially assumed there was a sediment concentration/deposition model coupled to a hydrodynamic model. But later its clear this is not the case. Personally I would merge section 4 and 4.1 and re-order the text to make it clearer to understand. At the moment the description of the model is spread over several paragraphs, which is quite confusing. When you go on to implement the models it was not clear to me if the test case was based around something real or if the modelling example was entirely synthetic. I probably missed a key statement on this but I think it needs to be much clearer how the model was set up. How were the values in table 1 obtained and what are the typical ranges for the values in table 2? Also it should possible to combine tables 3,4&5 and have all the results in one place. I would

also be tempted to combine Fig 16 with 17 and Fig 14 with 15 and 12 with 13, but this is purely stylistic. Conclusions: These are very concise and really only state the obvious. I would include a paragraph with the conclusions from the geoscience models and also comment on how widely you might expect these conclusions to apply, particularly in the case of higher dimensional models. Most geoscientific models are substantially more complex than the test cases you have implemented here. For example, salt marshes are often simulated using distributed rather than point based models, while a river sediment transport model would include components to handle bed and bank erosion, a number of sediment transport mechanisms and the flow hydraulics, they might also measure multiple model states e.g. sediment load and velocity. I'm not suggesting the paper needs to test many different model types but the discussion/conclusions should expand to cover this more 'realistic' range of numerical models and what issues a geoscientist is likely encounter. This, I think, could be done concisely without any additional analysis needing to be undertaken, such that the original per pose of the paper is not diluted.

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