Comment on gmd-2021-2

Anonymous Referee #2

Referee comment on "S2P3-R v2.0: computationally efficient modelling of shelf seas on regional to global scales" by Paul R. Halloran et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2021-2-RC2, 2021

General Comments:

The paper presents an upgrade to a previously published modelling system. Addressing forcing issues that allow the system to be run over larger areas and longer times. I believe this to be a sufficiently large advance in modelling science to merit publication. The methods are clear and well presented. The protocols appear to be well documented with the supplied code (though I have not tested them).

The document presents an honest accounting for the strengths and weaknesses of the modelling system. In places this is a little too sweeping, or lacking the detail that would permit the reader to make scientific inferences from the results. E.g. to what extent does the exhibited skill over the Patagonian or North West European Shelf imply that later fluxes are not important. But that is not the aim of the paper.

The results support the concluding remarks, except that I would more strongly state the possible value of this tool in education (perhaps to undergraduates?). I also think that the

value to policy groups of this "cheap" model is perhaps slightly dangerous if the output are not in some way corroborated with with existing data from higher-expense simulations. After all this paper, at length, highlights the gains in efficiency do come with a loss in skill.

Specific Comments:

p9. Fig 3 caption: line 6: Without parenthetic commas, the "therefore" comes in the wrong place. E.g. This might be clearer:

"Where this is positive there is a net heat flux into the ocean. So, assuming the system is approximately at steady state, advection of heat is therefore out of this area."

p9 line 15: should read "… more prevalent at low M2 tidal amplitudes…"

M2 is dominant in the North West European Shelf, in most places. But K1 can be relatively large in other regions, like the South China Sea

p10. Line 2. Unpack this line. Is it the case? Does Figure 5 exhibit smaller model biases in the summer? Confirm what you think my eyes are telling me.