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Interactive comment on "The seamless and multi-model coupling between atmosphere, land, hydrology, ocean, waves and sea-ice models based on SURFEX surface model using OASIS3-MCT" *by* Aurore Voldoire et al.

Anonymous Referee #2

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General comments:

The paper describes the coupling of the SUFREX surface model to a series of models using the OASIS3-MCT coupler different applications.

The title is, in my opinion, misleading. To me the word "seamless" means application of the same model to different time scales which is not at all what is described in the paper. I suggest to replace the word seamless with "versatile" which, again in my opinion, better cover the fact that the same surface model (SUFREX) can be used to

[Discussion paper]

combine different atmospheric models with different ocean models, wave models and hydrological models.

Section 2 describes the principle of coupling with OASIS3-MCT and is the most useful part of the paper.

Section 3 describes the various coupled models implemented with the SURFEX OASIS3-MCT coupling. This part is a bit repetitive with a lot of model this version that. Maybe all the various models and versions could be presented in a table instead. In line with the comment about on the title of the paper I also find the "multi-model and multi-scale" title misleading. To me the concept of multi-model means the use of multiple different models to the same problem (e.g. seasonal forecasting) with each of the models add information to the solution of the problem. The various examples of performance of the various modelling system in section 3 needs justification. The examples don't need to be changed, but I do miss a justification why they were chosen for the various modelling systems.

The equations needs some work. An example: Eq 7 looks like an imported picture and very different from Eq 8. Another example is that Eq 6 looks very different from Eq 1 even though they are very similar. The quantities from the equations should be in italics in when they are explained in the text. So I believe a careful rework of the equations are in order.

The way the physical quantities with units are presented is very inconsistent throughout the manuscript. As an example on line 405 is written: ". . .goes from 10 m near the surface to 700m at the model top. . .". There are too many examples on these inconsistencies to list in a review, so I think that the authors needs to read the GMD guidelines (http://www.geoscientific-model-development.net/for_authors/manuscript_preparation.html) and adhere to those (e.g. 700m should be 700 m).

References: There is a lot of typo's and spelling errors in the references, so they could

really use a careful checking. Also the use of colours and/or underlining for links to DOI's, URL's or sometime authors is very inconsistent throughout.

In summary: I think that the manuscript has quite some merits and is worth publishing, but it is a bit let done by lack of care to details which is far from publication quality.

Specific comments:

Line 45-46: It might be worth mentioning that coupled NWP has been implemented operationally since 2013 at ECMWF in their ensemble system. It is described in Janssen et al ECMWF Tech Memo 712.

Line 59: Sequential versus concurrent coupling also affect the time stepping of the whole coupled modelling system. If accumulated fluxes are used then the flux user component cannot run until the producer component has accumulated the fluxes unless lagged fluxes are used. It might be worth to make this point.

Line 99+101: SURFEX versioning conventions are inconsistent across V7.3 or v8

Line 135: The subroutine names below are not in italics on my print.

Line 203: It might reflect conventions of different communities, but both zonal/meridional and x/y is used to present vector components.

Line 210: za should be z subscript a. Also keep in mind the general comments on equations.

Line 244: Hs should be H subscript s.

Line 247: There is no mentioning on sea-ice in the coupling between ocean and waves. Are the sea-ice wave interactions (an active research topic) not taken into account yet? Section 3.2: The normal convention is to use DJF, MAM, JJA, SON for seasons, but the authors have chosen JFM, AMJ, JJS, OND. Why?

Line 364: I believe that the ORCA grid family denotes tri-polar global grids.

Line 374: UT should be UTC.

Line 452: Why is the "Marshall and Schott 1999" underlined and in blue?

Line 473: Replace "no longer coupled" with "uncoupled".

Line 526: Why does global conservation make the model expensive?

Table 1: Charnock name is just a square. Meridian should be meridional.

Figure 5: The right hand text box only applies to b) since it explicitly states the 26/27 of October. It should be changed to e.g. "first/second".

Figure 6: Bottom panels: OAV/OA should be OAV – OA since this is actually what is plotted. The number on the lower legend are very close (special on the right hand plot). I also find that the white colour for the SST contours a poor choice making it very hard to see these.