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Interactive comment on "A Schwarz iterative method to evaluate ocean- atmosphere coupling schemes. Implementation and diagnostics in IPSL-CM6-SW-VLR" *by* Olivier Marti et al.

Anonymous Referee #1

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Most existing coupled models suffer from the temporal inconsistencies at the interface between component models. This paper proposes a Schwarz iterative method that can reduce such inconsistencies as well as the corresponding errors. The experimental results demonstrate that the proposed iterative method can converge fast in an ocean-atmosphere coupled model and reveal that the temporal inconsistencies in existing coupled models can produce significant errors. This paper is well written and well structured, and the key idea is clearly presented. In my opinion, the idea and results in this paper deserve wide attentions from the community.

The following are my specific comments and suggestions.

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Discussion paper

1. It seems that an important pre-condition of the proposed Schwarz iterative method is that the converged solution of coupling fields at model time T1 based on the initial states at model time T0 is the exact coupling fields at T1. It will be welcome to state such a pre-condition and briefly introduce the corresponding theoretical supports.

2. The proposed Schwarz iterative method uses SST for judging convergence. One possible guess is that the convergence speed may be relative to the fields used. For example, SST generally changes slowly in time integration, which may contribute to the fast convergence. So, it will be welcome to evaluate the convergence speed using another field such as wind speed that generally changes fast, and it may be interesting to compare differences of solutions of coupling fields under different convergence variables.

3. The model used in this study is a climate model. It will be welcome to discuss possible application the proposed iterative method in real climate simulations. One possible challenge here is how to make the iterative method not break conservation. Weather forecasting that does not highly depend on conservation may be a potential application (this study uses 5-day simulation actually). It will be welcome to show the differences resulting from the iterative method after a 5-day simulation. Considering the resolution of weather forecasting becomes very fine, it will be welcome to evaluate or discuss the proposed method under finer resolutions.

4. It will be welcome to discuss applications of the proposed method in a model coupling with different frequencies (for example, an atmosphere model uses 1-hour frequency while an ocean model uses 4-hour frequency based on the averaged atmospheric values in each 4 hours), and discuss applications in a complex coupled model with more component models.

5. Many existing coupled models use concurrent coupling between atmosphere and land surface. I believe that this coupling can also benefit from the proposed method. It will be welcome to make a discussion, as land surface states generally change much

faster than ocean states especially at sunrise and sunset.

6. A brief introduction to IPSL-CM6-SW-VLR should be included in the abstract, as it has been included in the title.

7. It will be welcome to provide a table for how to evolve IPSL-CM6-LR to IPSL-CM6-SW-VLR.

8. It will be welcome to provide a figure for the software architecture of the IPSL-CM6-SW-VLR with the iterative method.

9. Line 181: “each coypling time step”=>“each coupling time step”.

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