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comment

Interactive comment on "Solar Forcing for CMIP6 (v3.1)" *by* Katja Matthes et al.

Katja Matthes et al.

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Dear Marty,

thank you very much for your suggestions and comments. We specify in our point-by-point response below how we plan to include them into the revised version of the paper.

Katja and Bernd on behalf of all authors

P3 L29: The text mentions uncertainties in the irradiance measurements, and there is no question that these uncertainties can be sometimes larger than solar variability at some wavelengths. There is a brief discussion that uncertainties in models are sometimes difficult to assess. Measurements only go back a few solar cycles, and both irradiance models are based on interpretation of those measurements. Extrapolating these proxy models to the past and future requires several assumptions about

proxy relationships remaining invariant. For example, the numerical relationship between sunspot number (or area) and the sunspot blocking function in NRLSSI2 could change if the sunspot contrast evolves over time. So it is not automatically true that we understand proxy relationships well enough over long timescales. Model development will continue to improve as we continue to make better measurements. State of the art model reconstructions as described in this manuscript are the best we currently have, but their uncertainties are also still significant.

Reply: We fully agree that all models (whether empirical or semi-empirical) most likely underestimate the SSI when moving away from the space age. You are right in pointing that out, and this will be emphasized more strongly in the text.

P9 L14: Averaging two quantities that disagree produces a result that is also not likely to be correct. Calling this "the most reasonable approach" is perhaps controversial. Maybe calling it "a reasonable approach" would be more appropriate.

Reply: This approach has indeed been met by some skepticism. We have here two models that have been derived almost independently, and as of today there are no objective criteria allowing us to prefer one to the other. In that context, from a statistical point of view, there is one clear and sound solution: just average the two. This solution is also what is advocated by the IPCC when combining GCM model predictions, see for example [D. Smith el al., Real-time multi-model climate predictions, Climate Dynamics 41 (2013), http://adsabs.harvard.edu/abs/2013ClDy...41.2875S]. We shall update our text to insist more heavily on this sound justification for averaging the two SSI models. We will also follow the reviewers suggestion and call our approach "a reasonable" one.

P9 L30: The comment that F10.7 was a good proxy for EUV at one time, but "this may not be true anymore" reinforces my discussion about page 3 above. It is an assumption that proxy relationships do not change over time, and this assumption must factor into the estimation of model uncertainties.

Reply: You are correct, and this is something that we should clarify in the text. We are

working on it in SOLID, but as you may imagine, it is difficult too to provide realistic confidence intervals for such long-term variations.

Overall, I think this manuscript does an excellent job in describing the recommended solar forcing for the climate community.

Reply: Thank you!

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