

This paper analyses whether oversimplification of the temperature response time in IAMs leads to a SCC that is too high or too low. The paper is very relevant, of a high quality, well-written and comes with a concrete recommendation. The analysis is correct. I have, however, a few relatively minor comments that could help improve the manuscript even further.

The two most important remarks I have relate to the choice of discount rates and damage functions.

Regarding discounting, the study includes two discount rates to analyse the sensitivity of discounting on results. Although widely divergent discount rates are used in CBA of climate policy, the author chooses two very similar discount rates: a constant 3% and a discount rate based on Ramsey, with parameters chosen in such a way that the discount rate equals 1.5 times the increase in per capita consumption. Since the increase in per capita consumption is close to 2% (world average), the Ramsey discounting method will be close to 3%. This gives the false impression that discounting only has a small effect on results (see Table 1). To analyze the potential effect of discounting on the results, a wider range of plausible discount rates should be used. For instance, the author could include Ramsey discounting with parameters by Stern (0.1 for pure rate of time preference, 1 for marginal elasticity of consumption) and with parameters by Nordhaus (1.5 for pure rate of time preference, 2 for marginal elasticity of consumption).

The choice of damage functions in the sensitivity analysis is even more peculiar. The author chooses to include the damage function of DICE - which projects (much) higher damages than FUND and PAGE - and a damage function as proposed by Weitzman which leads to even much higher damages than the DICE damage function. Instead of the Weitzman damage function, it seems more logical to include a damage function similar to that of FUND (although FUND has no aggregated global damage function, a proximation is possible). In this way, the range of damage projections currently applied in IAMs is taken into account.

Some other minor comments:

The author refers to the work of Van Vuuren et al. in the introduction. They did in fact conduct a very similar experiment as the experiment in Section 4.1 (the results of which are depicted in Figure 4.1). It would be very interesting to know if these two experiments arrive at the same conclusions regarding transient temperature response. Comparing Figure 4.1 with Figure 3 of Van Vuuren et al., results indeed seem similar. The strength of Section

4.1 could therefore be improved by a comparison with the results of Van Vuuren et al.

References to Figure 4.1 and Table 1 show up as question marks in text.

Page 18: "marginal elasticity of substitution" should be "marginal elasticity of consumption".

References of Van Vuuren et al. and Warren et al. should be updated (they are published by now).