I've received two sets of review comments on your submission "The Time Evolution of the Social Cost of Carbon: An Application of Fund." Reviewer #1 recommends minor revisions; addressing reviewer #2's comments will require much more substantial revision. I believe both reviewers' comments can be adequately addressed, but doing so will require both clearer explanation and some additional experiments, and an additional round of review.

I highlight some key areas below.

FRAMING: Like reviewer #2, I believe the paper requires considerably stronger framing. The introducing needs to provide a conceptual framework for understanding what follows and identify specific hypotheses as to the nature of the drivers controlling the time evolution of the social cost of carbon. A simple analytical model, as reviewer #2 suggests, would be one useful component of a way of communicating this framework.

PHYSICAL CLIMATE MODEL: Given the importance of the time evolution of climate in the SCC, this area should be explored further in the paper. Recent literature evaluating the climate components of cost-benefit IAMs (e.g., Warren et al., 2010; Van Vuuren et al., 2011) needs to be addressed directly, especially since these papers indicate that FUND appears to significantly underestimate transient climate response for a given equilibrium climate sensitivity.

On a related note, on page 4, reviewer #1 raises an important question regarding the relationship between the e-folding time of global mean temperature and climate sensitivity. This two factors should be related, since the effects of higher climate sensitivity take longer to be realized (e.g., Hansen et al., 1985).

SCENARIOS: The multiple SRES scenarios used for the analysis convolve changes in income growth, population growth, and emissions. Reviewer #2 recommends teasing these changes out, which would be quite helpful in developing the reader's understanding of the factors at play. If emissions are held constant, but the income growth rate is increased by 50%, how does the SCC change? (And does the SCC change vary depending on the coefficient of relative risk aversion?) If the GDP and population pathway are held constant but emissions decrease at a rate of 1%/year, how does this affect the SCC change?

RELATIVE RISK AVERSION: I find it somewhat surprising that the paper does not examine the effects of the coefficient of relative risk aversion on the growth rate of the social cost of carbon; indeed, the paper needs to be more clear what assumptions about RRA are being made. I would expect that the relationship between per capita income growth and the SCC to vary depending on then value of RRA used.

DAMAGE FUNCTION SPECIFICATION: Reviewer #2 notes that it is unclear what specific modifications were made to the model in order to implement different damage specifications. For example, how were the linear damage functions calibrated?

COMPARISON TO LITERATURE DISTRIBUTION: As reviewer #2 notes, references and details (preferably highlighting key assumptions such as scenario, RRA, pure rate of time preference, etc.) need to be provided or referenced.

NORMAL VS LUXURY GOODS: Discount rate as such (rather than pure rate of time preference) is barely addressed in the results section; the discussion at the end about the growth rate of the SCC relative to discount rate needs to be better grounded in the results.

FIGURES: The figures, showing the time evolution of SCC under different assumptions, are often hard to read because the first-order change between assumption sets is the initial value of the SCC. The second-order effect, the change in the rate of SCC growth, is hidden when there is an order of magnitude range in the initial SCC. You might considering normalizing to first-period SCC in order to highlight changes in growth rate.

REFERENCES

Hansen, J. et al (1985), Climate response times: dependence on climate sensitivity and ocean mixing, Science, 229, 857-859.

van Vuuren, D. P., J. Lowe, E. Stehfest, L. Gohar, A. F. Hof, C. Hope, R. Warren, M. Meinshausen, and G. K. Plattner (2011), How well do integrated assessment models simulate climate change?, Climatic Change, 104(2), 255–285.

Warren, R., M. D. Mastrandrea, C. Hope, and A. F. Hof (2010), Variation in the climatic response to SRES emissions scenarios in integrated assessment models, Climatic Change, 102(3-4), 671-785, doi:10.1007/s10584-009-9769-x.