

Interactive comment on “GCAM v5.1: Representing the linkages between energy, water, land, climate, and economic systems” by Katherine Calvin et al.

Anonymous Referee #2

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This manuscript briefly introduced the GCAM model structure, the core systems (socioeconomic, energy, agricultural and land use, water, climate), and the databases. The authors provided 11 scenarios based on the combinations of different socioeconomic and climate policy assumptions, and illustrated the results. Overall, the manuscript was useful for the readers to understand this model, and the data source and references are valid. I would recommend it to be published after the following issues are clarified.

Generally comments

Since the new version of GCAM v5.1 is introduced in this manuscript, a summary of

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updates from the previous version is necessary to be provided clearly, in aspects of model structure, databases, linkages, etc.

The 11 scenarios were analyzed mainly based on the global scale. I would suggest the authors to provide some country-level discussion or analysis. I think that will be helpful for us to understand the discrepancy in changes among regions or countries estimated by the model.

Specific comments

Page 2 Line 20, “There are a number of models in the community with similar overall scope to GCAM, although each has a unique structure and focus.” Could the authors provide a summary about what the unique ability of GCAM have? Any advantages and disadvantages about all the models?

Page 4 Line 12, “The exact share a given option receives in GCAM depends on the logit exponent and the share weight”, What is the difference between logit exponent and the share weight? I would suggest the author to provide the formula to demonstrate how the logit exponent and share weight influence on the decision making.

Page 6 Line 3, “whereas depletable resources are indicated as cumulative resource quantities (in EJ), which are drawn down in each time period.” How to determine the total available amount for depletable resources? Is it fixed or changeable?

Page 6 Line 21, “the additional cost is equal to the emissions price multiplied by the amount of emissions of the specified species released per unit of output.” How is the emission price calculated in the model for CO₂ and non-CO₂? Is it related to the control measures of pollutants or their harmful effects? Will it change over time?

Page 6 Line 31, the emission factor is actually related to the control application rate. When control rate is high, the emission factor is low. How was it considered in the model?

Page 7 Line 15, “Final demand sectors include buildings (residential and commercial),

transportation (passenger and freight), and industrial (fertilizer, cement, and general industry) sectors.” Have the detailed transportation types been considered, such as aviation, railway, in-land water, shipping, etc.? Will the detail industrial sectors be included in future?

Page 10 Line 2, “water supply is an unlimited resource” The water supply is very limited in some regions, such as desert. Will it be an issue?

Page 19 Line 17, “Research versions of GCAM already include new dynamics such as the effects of climate on water supplies, energy demands, and crop yields.” Any references to provide here will be good

Figure 4 and Figure 9, since there are no differences between CORE and CORE-26 (barely see the dashed line), I would suggest just use one series in the plot, for both CORE and CORE-26

Figure 5, two “geothermal” here, i and I

Figure 5 and Figure 10, I would suggest to delete the first letter for each series label

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