

Interactive comment on “GIR v1.0.0: a generalised impulse-response model for climate uncertainty and future scenario exploration” by Nicholas James Leach et al.

Anonymous Referee #2

Received and published: 26 March 2020

The manuscript "GIR v1.0.0: a generalised impulse-response model for climate uncertainty and future scenario exploration" present a simple climate model, that consists of six equations, that can easily be implemented in other models regardless of code language and also used in software such as Excel. The potential use of the model can therefore be widespread.

I have only minor comments to the manuscript as follows:

L 8. It could be highlighted more the tunable nature of the model. In other parts of the manuscript it is nicely written e.g. : “Here we emphasize that the models themselves are not systematically biased either low or high - it is the parameters used, and how

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these are selected, that determines the model response. ” This could be emphasized even more in the abstract.

L33. The differences between SCMs and ESMs here are runtime and lines of code. Complexity should also be mentioned. SCM: only global, global mean temperature, while ESMs three dimensional, gridded, large set of variables, not only temperature etc.

Figure 1: It could be useful if R, T, G, S, etc. could be defined in the figure caption.

Figure 2: Here, and elsewhere in the manuscript, references are written without a year. E.g: “from Meinshausen et al. concentrations”. Add “(CMIP6 historical)” to the figure caption. Indicate end year in the figure. Or mention in the caption. I am not familiar with the use of TgN₂O-N₂. Better to use TgN instead? (same for L401)

Figure 3: Unit on the y-axis are missing.

Table 2: In the table caption, add which indirect forcing effects that are included in f2.

L245: Any reference to the high correlation for total ozone and CH₄ concentration?

L 371: typo

L 385: “While this harmonization procedure may not exactly match the one used in the database scenarios” Do you mean the harmonization procedure that are used in the SSP database? A set of the scenarios are harmonized to historical emissions in the SSP database. Why did you not use them? And related to L387, isn’t these harmonized emission scenarios in the SSP database what you ask for?

Also, regarding the scenarios, there are many ssp scenarios available, generated by different models. Please specify which ones you have used. I guess it is the unharmonized marker scenarios?

Figure 4, 5 and 6, there are more than hundred SSP scenarios. Replace a “range of SSP scenarios” with “three SSP scenarios”?

Figure 4: Add in the figure caption why the dashed and dotted lines are not included in CH₄ and N₂O figure? Add what the shading and error bar in the figure represent.

Figure 5: In figure caption concentration is written. Replace by ERF. Also here indicate what the shading represents.

L 447: To fully emulate the CMIP6 ensemble, aerosol ERF must also be tuned. This is not mentioned in the text. Please discuss how this can be done.

In the conclusion section, first differences to FaIR v1.0 is presented, while later results are compared to FaIR v1.3. In the first part of conclusion, also present the differences to FaIR v1.3.

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