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Interactive comment on "PMIP4 experiments using MIROC-ES2L Earth System Model" *by* Rumi Ohgaito et al.

Anonymous Referee #2

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The manuscript documents four PMIP4 experiments setup with MIROC-ES2L Earth system model, and evaluate the model performance by comparing with the published proxy data indication. The authors made efforts to run long spin-up for LGM and presented the spin-up process step by step in detail. The other three experiments setup are relatively easier to setup and needs shorter spin-up time than the LGM experiment. The evaluation of the model results are shown for temperature and precipitation through model-data comparison, which is understandable since only these climate parameters are widely reconstructed. MIROC-ES2L is an earth system model, and most of the components are turned on for the PMIP4 experiments (my guess, the authors should confirm this in the paper), means the model is able to produce more physical parameters than those available from proxy data. It is worthy to present more features

such as sea-ice, deep ocean temperature and salinity, carbon cycle, modelled dust etc, to show the advantages of an earth system model. I suggest the authors do a major revision by adding more information to promote the ESM's capability.

Specific comments:

Line 53-54: Are these models include the interactive dust, or do you mean the pre-scribed dust emission is not proper and may influence the simulated temperature? It would be interesting to see the dust simulated in MIROC-ES2L and compare with the prescribed dust, especially for LGM.

Line 98: "The ecosystem modules can simulate global carbon and nitrogen cycles ex-plicitly." As listed in table 1 for all the experiments the GHG concentrations are following the PMIP4 protocol. It is not clear if the ecosystem modules are not turned on and how does the model treat the CO2 and N2O in the atmosphere, please clarify.

Line 100: "Dynamics of aerosols are calculated by an online aerosol module". Since most model that does not have an interactive aerosol module use the prescribed PI aerosol for all the past periods, I am curious if the dynamical module in MIROC-ES2L simulated aerosols, such as dust, are different from those prescribed aerosols.

Line 105-106: Are the model configurations (interactive components) and resolutions same in the DECK and PMIP4 experiments?

Line 138-140: These parameters are listed in the table 1 and no need to repeat in the text.

Page 21, table 2: This table does not provide more information than the description in the text, either remove this table or provide more specific information than only given the reference.

Line 680, Fig6b: there is a sharp gradient at around 30N, can you explain?

Line 221-225, regarding the HIST part in Fig13, more information about the three en-

sembles during HIST period are needed. The HIST part in Fig13 is hard to observe and compare. It would be more informative to show another figure only for HIST part, in order to draw the conclusion that the initial conditions for HIST from the end of LM experiment is similar to that from the long PI run, and discuss if this is the case for other models or it might be model dependent.

The authors present the four experiments separately, a summary table or figure to compare the four past periods would be helpful to have an overview of the climate change, and differences of modelled glacial and interglacial climate.

Minors:

Line 36, "the Pliocene", should be " mid-Pliocene (3.2 million years before present)". Line 181, "by PI", suggest change to "in PI or at PI".