1. **Remarks regarding the model and simulation description**
   - Could the authors provide in their text on page 3 details regarding the employed model version of the oasis coupler and include the respective reference?
   - Furthermore shortly after that: I think the description of coupling “every model day” is ambiguous. Do the authors mean that the coupling occurs exactly once per model day? Please clarify the text accordingly.
   - On page 3, lines 29/30, the authors state that MOSES2 introduced “improved representation of surface and land processes”. Could the authors please elaborate this statement in their text to make clear what kind (and to which degree of detail) respective processes are represented in their model? Giving some respective references would be appreciated.
   - The meaning of the statement “upper layer of ocean” on page 3, line 32 is not clear. Do the authors state that the runoff is somehow vertically distributed over the layers of the upper ocean, or is it given exclusively to the uppermost ocean layer? Please clarify the text accordingly.
   - On page 4 the authors describe that the ocean model employs z-type cells with bottom topography represented by “full” cells. Does this mean that bathymetry is adjusted so that at the border between ocean and sediment the lowermost “wet” ocean grid cell has always the standard thickness defined in the model, rather than a thickness adjusted to represent bathymetry as closely as possible – an approach, that is employed in the case of the “partial grid cell” scheme applied by some other models? If indeed the layer thickness is not adjusted to bathymetry, I would imagine that, in addition to the various approximations involved in the generation of the Pliocene bathymetry, there is another substantial approximation in that for deeper regions of the ocean, where the layer thickness is assumedly relatively large, the modified Pliocene bathymetry is significantly changed to fit it to the layer thickness. Could the authors please explain this a bit more detailed in the text?
   - Could the authors please add a remark whether the ocean grid is aligned in such way that one atmosphere grid cell covers exactly 6 ocean grid cells (the term “exactly”) is not clear to me. Furthermore, does the statement “The land-sea mask is effectively 3.75x2.5° resolution in the top 200 m, but beneath increases to 1.25° resolution.” imply that there is some kind of horizontal interpolation of vertical fluxes occurring at critical depths? If so, what is the nature of this interpolation?
   - The authors describe that they employ a prescribed time-invariant freshwater iceberg field that is omitted for Pliocene simulations. What is not clear to me is whether such omission is also done for simulations E400 and E560, where the climate state is as well much different from the one simulated in E280, for which the modern iceberg conditions are probably optimized or derived. This could be explained, and the respective impact on the interpretation of results could be discussed later on.
   - Related to this topic, regarding the artificial closing of the water budget for Pliocene simulations: Is the artificial budget term somehow regionally distributed, potentially weighted with regard to (a modern) salinity distribution of the ocean? Or is it rather a globally distributed residual term? This should be explained in more detail as I expect that depending on how this correction is applied a significant impact on buoyancy-driven ocean circulation cannot be excluded. Furthermore, it may be interesting to state the amplitude of the freshwater flux that is applied in order to close the water budget.

- At the bottom of page 4 the authors describe that “Ice drifts only by the action [of] surface ocean current.” Does this imply that wind stress has no direct influence on sea ice transport? Please clarify in the text.
- On page 5, line 9, the authors write that “pre-industrial experiments are run at 280, 400, and 560 ppm”. I think this statement may be a bit misleading, as pre-industrial is characterized by CO2 of around 280 ppm. Would it make sense to rephrase this pointing out that “simulations based on a pre-industrial geography” are run with differing levels of CO2?
- On page 6 the authors write that corrections were applied “using a model resolution river routing model”. Could details of this procedure be included into the text? Does this, for example, imply eliminating internal drainage basins?
- The authors write on page 6 that a BIOME4-to-MOSES2 lookup table has been employed. I think it is important for the less experienced reader to point out that the PRISM4 boundary condition is based on BIOME4, if I am not mistaken.
- Could the authors give a reference that explain details of the xancil and um2nc tools mentioned on page 6?
- On page 7 it is described that the CO2 is adjusted via a 1% CO2 ramp like in the respective CMIP6 simulation. Is there a specific reason for this methodology of creating a Pliocene model setup? Please explain.
- On page 7 the authors explain that the final 50 model years are used for computing climatological averages. Considering the potential presence of slow variability in the model simulations, could the authors state whether results would look different if instead 100 model years are employed? What is the official time period over which PlioMIP2 climatologies shall be aggregated?

2. Remarks regarding derived results and interpretations made by the authors

- Regarding Fig. 2: It is not clear to me which simulation is represented by the data – or is it an average over various simulations? Please add this information to the text.
- On page 9, lines 4 and five one could add to the results of Climate Sensitivity (CS) the statement that due to the overlap of variability ranges there is no significant difference between the model CS for the different climate states. Furthermore, based on rough calculations of presented numbers: Should the result 2.9°C for Pliocene CS should rather read 2.8°C?
- Significant digits: I think the ESS/CS ratio should be 1.9°C rather than 1.90°C to honour the limited precision of the value used to compute that ratio.
- On page 9 the authors write that they “neglect” changes in topography and land sea mask. Would the meaning of the sentence get clearer if it was changed to: “… hence assuming consistency of ice sheet topography and land sea mask with the (simulated or in the boundary condition assumed) climate state”?
- On page 11, line 28 it is stated that sea ice extent is significantly suppressed within the Weddell Sea – is the significance of the change really shown?
- In the context of Section 4.2.3 I believe Fig. 11 should be referred, otherwise the textual description of results is difficult to follow.

- The statement on page 12, line 16, that the difference in AMOC can be ascribed to the earlier use of HadCM3 MOSES 1 seems to be a bit uncertain. As there are no variability ranges given by Bragg et al. (2012), one can only speculate whether there are significant differences between the AMOC values, or whether there is an overlap of both results. The authors elaborate later on that the original time series of AMOC by Bragg et al. (2012) are lost, impeding the computation of the old error ranges. Yet, this problematic should be mentioned here when ascribing a change in a result to a difference in the model version.
- On page 12, line 17, it is stated that the maximum AMOC strength is at about 1000 m depth. By eye Figure 12 suggests a rather shallower depth. Please verify and correct if necessary.
- In the same line the authors write about “Fluctuations of the order in the AMOC”, without specifying the order of the fluctuations. It is also not clear what the difference in Mid-Pliocene and PI fluctuations should be. I at least do not see an obvious difference from the presented results. Please clarify.
- On page 13, line 12, the authors state that ACC strength appears significantly reduced in Pliocene experiments. Looking at the conveyed data, I get the impression that also the variability over time is reduced in the simulations. Is this impression correct? If so, I would state that as well in the text, and maybe discuss the implications for the Pliocene circulation regime in the Southern Hemisphere.
- In sections 4.3.1 and 4.3.2 the authors elaborate on the statistical significance of differences between simulations with differing orbital configuration and TSI. I have to admit that I got a bit lost here. While the statement seems to be that there are statistical differences, my impression from the values given in the various tables is that simulations with different orbital parameters and TSI indeed show different mean values of respective quantities, but that in many (if not all) cases there is an overlap of the given variability around the mean value. Based on this observation I would assume that there is no statistical difference. Could the authors please clarify this in the text? I might have misunderstood their reasoning, but the matter is not yet clear to me.
- In the discussion the authors state that the primary control on ESS/CS ratio is the reconstructed ice distribution and global vegetation coverage. Assuming a prescribed vegetation, this is certainly the case. Yet, there are also modelling groups that will likely provide simulations with dynamic vegetation. Hence, the statement made by the authors could be explicitly tested in PlioMIP2. I would add some according remarks to the discussion section.
- On page 15, line 19 following. I am not sure whether details and results of simulation Ei280, that is not considered in the manuscript, should be discussed here. Either, the relevant results should be explicitly shown somewhere before, or the results and discussion should go into the follow-up manuscript. Similar statement holds for the mentioned simulation Eo400.
- The statement on page 15, line 26/27, that the findings are in contrast to Zhang et al. (2013): Is there really a contrast? Zhang et al. (2013) shows various models that have a stronger Mid-Pliocene AMOC. So aren’t your results somehow in line with findings by Zhang et al. (2013)?
- On page 15, line 30, you state that “looking at typical HadCM3 (MOSES2) AMOC variability within Table 7”. Where do I find this information in Table 7 (or somewhere else)? The understanding of the whole sentence in reference to PlioMIP1 is lacking to me.

3. **Remarks regarding quality of the presentation of results**
   - Regarding labels (a, b, c, …) of subfigures: All subfigures are clearly labelled, which is very good. Yet, in very few cases the caption clearly defines what simulation, time average, etc. a label refers to. Instead, in many cases a heading is given for the subfigure that illustrates that information. As far as I know the use of labels is the preferred option for publications in Climate of the Past, rather than a subfigure heading that often reduces the space available for the illustrations themselves. If the authors choose to keep subfigure labels (which I strongly support), I would make sure that the meaning of a label is clearly defined in the figure caption.
   - There is a prominent switch in the terminology employed in the various tables of the manuscript. In Table 1, the first column is headed “ID”, but in following tables it is headed “model”. One may argue which is the better term (I would opt for ID to avoid potential overlap with the term ‘climate model’, which is consistently HadCM3 for all simulations) – but at least the employed term should be consistent across tables.
   - The authors state at the beginning of Section 4.1.2 that MAP is influenced principally by geography and land surface changes and is relatively insensitive to Pliocene CO2 changes. Is this statement supported by the presented results (difference between results for Eoi280 and E280 is only 0.07 mm/d, which is somehow in the range of the change created by modifications in CO2)?
   - In the same section, it is stated that regions with little change in precipitation are regions that receive little precipitation in E280. Isn’t this statement in contrast to the results derived for the rather large region of Eurasia?
   - On page 9, at the bottom, and on Page 10 up, the authors describe the simulated monsoon. I have to admit that the statements were difficult for me to verify and to follow based on the presented anomaly results. Am I right that showing an additional Figure with (seasonal) absolute fields of precipitation (MAP) for E280 would help to solve this problem?
   - The change in the northern cell (by +10.8%) is difficult to identify in Figure 7, even when zooming in on the screen. This should be fixed if possible.
   - The stated moving of the jet stream mean path from northern to southern Europe is very difficult to see in Figure 8.
   - The statement on the more continuous counter current in the Pliocene (Fig. 14, stated on page 13, line 29) is difficult to interpret from the illustrations as individual arrows of the streamlines are difficult to see.
   - I would like to point out that in my opinion the discussion provided by you regarding uncertainties due to setup of the Pliocene boundary condition – despite a common modelling protocol – is very important.
   - In addition, I think one could elaborate (a bit more than already done) why the question after analogy or non-analogy of the Pliocene climate to modern or future conditions is so important in the context of Pliocene for future (P4F). I think references could be cited, e.g. Hill (2015) may be of relevance here.
   - Page 21, Figure 1: I would add the term “streamfunction” after (the non-capitalized) term “barotropic” for consistency with the heading of section 3.2.2.
   - Page 22, Figure 2: It is not clear which simulation is shown here. Add space between the subfigures. Maybe enlarge them and put them on top of each other. Would it be possible to give the depth information in addition to the layer information? Regarding the caption: I would add a “various” before “ocean layers”, make the comma after “spin-up stages” a colon, change

"souther" to "southern", and remove the hyphen of "high-latitudes". "Incorporation", "Correction", and "Ocean layers" should in my opinion not be capitalized.

- Page 23, Figure 3: The physical unit is not given. Should "MAT" read "MASAT"? Should "student" be capitalized? There is no reference in the caption to subfigures a) to f), and there is no information in the caption that also two different Mid-Pliocene realisations are shown here.
- Page 24, Figure 4: May it be that the figure is not explicitly referenced and used in the text? Could it be that captions of Fig. 3 and Fig. 4 where mixed up? Please check and correct if necessary. The physical unit is missing. Add reference to subfigures.
- Page 25, Figure 5: Add reference to subfigures in the caption and fix capitalization of "Mean Annual Precipitation".
- Page 26, Figure 6: I noticed that there is a gap in the stipples around the 0°E meridian (also the case for at least Fig. 5). Are stipples shifted or is there a data gap, and what does that mean for the interpretation of stipples in comparison to the shaded values? Add reference to subfigures in the caption.
- Page 27, Figure 7: The plots are too small, maybe put on top of each other and enlarge. Add reference to all subfigures in the caption. Replace "every" by "shown for intervals of". Is the statement "ascending air moves southward" only true for counter-clockwise flow?
- Page 28, Figure 8: Is there any way to enlarge the figure a bit more? Some details are difficult to decipher from the rather small plots. Point out in the caption that left is Northern Hemisphere, and right is Southern Hemisphere. Remove space in the superscript of simulation E280. Employ the defined abbreviations consistently throughout the caption. Add "by" after "typology", "the" after "Note", and "but" before "instead".
- Page 29, Figure 9: The physical unit is missing. Could you explain (and correct if necessary) why there are two definitions for the warm pools applied (28°C and 28.5°C), also with respect to Table 6? Remove the "s" from "indicates", add a "the" before E280, capitalize "Pliocene", and change "have contrasting land surface" to "have land-sea contrast". Add information on the criterion for the decision on statistical significance of anomalies.
- Page 10, Figure 10: I think the labelling and the respective reference in the caption is incomplete (that is certain) and potentially also wrong. Capitalize "Southern Ocean".
- Page 31, Figure 11: The unit is missing. Give details of subfigure-label relation in the caption. Could you please elaborate (in the main text) why March and September means where shown in the plots, rather than, for example, boreal spring and boreal autumn?
- Page 32, Figures 12 and 13: The figures are too small, maybe combine them on top of each other. Add an "N" to the x-axis labels. The units are missing. Please specify the time interval that the data average represents (100 yr multiannual means? Maybe also consider this for other figurs). Note the flow direction (e.g. clockwise circulation given for positive values). Maybe put the subfigure captions at a different location, they are difficult to read for PMOC plots. Add a space after (PMOC). Add the term "Meridional" before "Overturning".
- Page 33, Figure 14: The physical unit is missing (maybe cm/s?). Do not capitalize "Mean Annual". Remove the "the" before (c).
- Page 34, Figure 15: Define abbreviation MAT, and do not capitalize the words for a), b); c), d); e), f). The units are missing.
- Page 35, Table 1: There is a problem with the text below the table ("our standard a discussion ...").

- Page 35, Table 2: Do not capitalize “Climatological”. Consider to use “ID” as heading for the first column (also for all subsequent tables).
- Page 36, Table 3: Do not capitalize the m of “1.5 M”. Could you provide the definition of polar and tropical regions as used in the analysis? Do the terms follow standard definitions? Add the physical unit to the third column. I am a bit puzzled that the standard deviation of the third column is 0.7 °C for all simulations. Is this correct or is this a mistake?
- Page 36, Table 4: Do not capitalize “Annual”.
- Page 36, Table 5: Define abbrevation StJ in the first line of the caption, and apply it in the second line of the caption.
- Page 37, Table 6: Fix the typo in “charactersistics”. Below the table, clarify why the warm pool criterion is 28°C (rather than 28.5°C as given for the respective SST figure). In the first line below the table, there is a word missing towards the end of the line (maybe 28°C-criterion?). In the third line, I think one should adjust the text to “mean area that is at 28°C or above”.
- Page 37, Table 7: In the column headings, fix the superfluous space between “AMOC” and the subscript “max”, add °-symbols to “N” and “S”, and maybe change “>500 m” to “below 500 m”. Specify the meaning of values given in rectangular brackets of the last column. Define +ve and -ve PDW. Fix typo in “meriodonal”. Is the abbreviation MOI used? Link the incomplete sentence “Pacific Meridional Overturning Circulation (PMOC)” to the rest of the text.
- Page 38, Table 8: Fix naming of the current (see my discussion at a different location). Do not capitalize “Mean” and “Barotropic”. Make sure that the plus-minus sign is not separated from the 50% value via a line break.
- Page 38, Table 9: Fix capitalization.

4. Referencing

- There are various references in the text that do not appear in the list of references at the end of the manuscript, which makes it unlikely for the reader to find the referenced literature. Respective references are often also wrongly formatted (e.g. with respect to use of comma between authors and publication year). I have found at least the following references that definitely need to be added to the list of references:
  - Johns et al. (2001)
  - Matthews et al. (2016)
  - Levitus and Boyer (1994)
  - Edwards (1989)
  - Wilson and Henderson-Sellers (1985)
  - Randall et al. (2007)
  - Lie and Xie (2014)
  - Stachnik and Schumacher (2011)
  - Archer and Caldeira (2008)
  - Koch et al. (2006)
  - McCarthy et al. (2015)
  - Jackson and Vellinga (2012)
  - Delworth et al. (1993)

5. Language- and nomenclature-related remarks

- The authors employ various abbreviations, which is fine. Yet, not all of the abbreviations are defined in the text, and respective definitions are even rarer in the captions to figures and tables. While it is difficult to decide which abbreviations can be assumed to be understood by the readership, I would suggest to strictly define them all – in particular to ease understanding of the work by non-experts of the subjects of Pliocene, PlioMIP, CMIP/PMIP, and IPCC, that hopefully will also be attracted to reading this work in the context of informing themselves about the potential relevance of Pliocene climate for projections of the climate of the future. I would suggest to make sure that the following abbreviations are defined: HadCM3, PRISM4, GCM, CMIP3, IPCC, AR4/5. I may have overlooked some more, so ask the authors to once more check the completeness of the definition of abbreviations used throughout the text.
- Another important remark regarding abbreviations: Please define abbreviations at the first occurrence of the text and only there, and, once defined, use them in all cases. Exceptions are the abstract, figure and table captions where abbreviations used in the respective text unit should be redefined regardless of their appearance in the main text (the latter is not everywhere the case). One case, where abbreviations are not consistently used, are the terms Figure (also used as Fig. and Fig) and Table (also used as Tab.). Another example is the abbreviation LSM for land sea mask, that is defined for the first time on page 6, while the full term is used various times on preceding and following pages. Similar problems are with polar jet (PJ) and Subtropical Jet (StJ) as well as with the term sea surface temperature (SST).
- Nomenclature regarding simulations: It must be made more clear what the authors mean with the term ‘control’ Pliocene experiment. In the abstract that term is used without explanation. While I assumed that ‘control’ stands for ‘CORE’ (the Eoi400 simulation), and then was surprised by the apparently rather small difference in global mean surface air temperatures that the HadCM3 Eoi400 CORE simulation assumedly provides if compared to E280, digging deeper into the text reveals that ‘control’ rather refers to simulation Eoi280. This is confusing even if one has the list of simulations (and simulation names) as proposed by Haywood et al. (2016) at hand. Maybe avoid the term ‘control’ altogether to avoid confusion and rather refer to the standard simulation names. Or, if you intend to use the term, make sure that it is clearly defined.
- It is not fully clear to me what climatic quantity the authors refer to when they talk about “air temperature”. At one point of the text an air temperature at 1.5 m height above the ground is mentioned, but it is not clear to me whether all results in the text, in tables, and all air temperature illustrations in the various figures refer to this height (or maybe to a different height, like 2 m, or even to the surface skin temperature). This could be clarified if the height above the ground was specified together with a definition of the term surface air temperature at the earliest convenient location of the text, and if subsequently that definition is consequently applied throughout the text.
- There are various definitions of SAT (MAT, MASAT, SAT?) – my feeling is that they all refer to the same quantity – if so, please use only one abbreviation.
- There is a problem with the term Antarctic Circumpolar Current (ACC) in Section 4.2.5 and related text. The section is headed “Antarctic Circumglobal Current”, and that term appears to me at least to be unusual. Furthermore, at some locations the term Antarctic Circumpolar Current is used then anyway, although not abbreviated. Last but not least, understanding the text becomes even more complicated due to the appearance of the terms Antarctic Counter current and counter current, the former one could equally be abbreviated as ACC. The latter terms are

to my knowledge different from the former terms, and rather refer to the near-coast flow in opposite direction to the ACC. This section left me puzzled with regard to the currents that were referred to in the various locations of the text. May I kindly ask the authors to overhaul this part of the text in order to clearly define ACC, Antarctic Circumpolar Current, and counter current?

- Definition of time periods: There are at least two versions of the term pre-industrial period employed in the manuscript (pre-industrial and preindustrial). I would use only one, and in addition define once that it refers to simulation E280 (this has not been done if I am not mistaken). Furthermore, within PlioMIP there are various terminologies regarding the Pliocene time slice: Mid-Piacenzian (e.g. Dowsett et al., 2016), Mid-Pliocene (e.g. Haywood et al., 2016), and Pliocene (employed by the authors of this manuscript). If the term is defined clearly in the manuscript at the earliest available convenience, then in my opinion all three are suitable choices. Yet, the reference to the alternative term in the discussion on page 15 is in my personal opinion a bit late.
- There is quite a variety of the use (or non-use) of spacing of physical or geographical units from the respective value (X) and within the units themselves. I think the text would look much cleaner after a respective overhaul. I think that there should never be a space within physical units, also to avoid that part of the unit is separated and put into the next line in the proximity of line breaks. Here some of the examples that I found:
  - X ° C vs. X °C (I would opt for X°C, which seems to be a commonly followed typesetting for temperatures on the Celsius scale)
  - X W m^{-2} vs. X Wm^{-2} (I think X Wm^{-2} is the best choice)
  - X % vs. X% (as percentages are not a physical unit, I think X% would be the choice here); similarly for X ° N, X° N and X °N
  - sometimes the °-sign is rather an superscript ‘0’, that looks a bit unusual
  - I would not put a hyphen between the pressure value and the unit hPa, but rather a space (see line33 on page 9)
  - Although this is not a unit, also the tilde ‘~’ for approximative values should be used with a consistent spacing from the value; I think best choice would be no space; most tildes are typeset too large; I think the one in line 19, page 12 looks good, although that one is separated from the number.
  - Spacing is also an issue with greater and smaller signs (‘>’, ‘<’), who also appear overly large at many locations.
  - It would be good if a consistent capitalization (and “spacing- or non-spacing-between-words”) scheme would be employed throughout the manuscript. There are terms that are inconsistently capitalized at various locations. While often one may argue which parts of a term are to be capitalized, I think a good rule of thumb is that either all words belonging to the term are to be capitalized, or none of them. I would kindly ask the authors to check this for the following terms:
    - Atlantic Meridional Overturning (is there a reason why sometimes the term is referred to Atlantic Meridional Overturning, and sometimes to Atlantic Meridional Overturning Circulation?)
    - CORE vs. Core vs. core
    - Greenland Ice Sheet vs. Greenland icesheet vs. Greenland ice sheet (I think the first version is the best choice)

- Northern Hemisphere vs. northern hemisphere (same for Southern Hemisphere); I believe these should be capitalized per common standard
- Barents Sea
- annual temperature anomalies, similarly seasonal temperature anomalies
- mean annual precipitation
- South Pacific Convergence Zone
- Western Pacific
- Polar cell(s)
- warm pools
- Barents Sea
- austral summer
- mixed layer depth
- deep water formation
- Nordic Seas
- Drake Passage
- barotropic / baroclinic velocity or solver

Last but not least I will list some more specific remarks where the authors could consider to check the text once more and correct if appropriate. I will give these remarks with pages (P) and line numbers (L) as reference.

P1L4: Add a comma after “ocean state” for clarity of the sentence.

P1L5: Add “and various related sensitivity studies” after “Pliocene experiments” to make clear that also simulations that are representative of a potential future climate and of alternative realizations of a Mid-Pliocene climate are covered by the work.

P1L7/8 When giving results that illustrate the global average climate state due to changes in CO2 and paleogeography, please clearly refer the respective simulations for clarity to the reader. These lines left me behind puzzled after the first read.

P1/L9 I would add an “of” after ESS/CS ratio.

P1/L10 I think the term “wet-get-wetter” necessitates a bit of explanation for readers that are not used to the concept.

P1/L15 Delete the comma after “PlioMIP2”.

P1/L17 (and some other locations with similar formulations): Is it common English to write “the total solar irradiance choice”? I would rather write something along the line of “the choice (of the strength or value of) solar irradiance.”

P1/L18 This may be a matter of argue, but isn’t there only one climate system, rather than more than one? If the authors agree with me, then one could rather formulate similar to “climatic subsystem” or “components of the climate system”.

P1/L20 There is a superfluous space between “PlioMIP2” and the following semicolon. Furthermore, one could argue that the semicolon after “dual focus” could be rather a colon.

P1/L21 There is a problem with the formulation “through its uses a” (probably “as” is missing before “a”, and “uses” should be rather singular). Furthermore, I would argue to replace “contemporary climate” with “future climate”. While simulation E400 is forced with a CO2 concentration very similar to modern values, one can argue that the resulting climate is not representative of modern observations due to the large degree of disequilibrium of contemporary climate with contemporary greenhouse gas forcing.

P1/L22 I do not see the link between “as a means to evaluate climate model uncertainty” with the previous statement that the time period is a potential analogue for future climate. Are these two uses not independent from each other? Please clarify the text accordingly. Furthermore, I would add “use cases” between “These” and “are”.

P1/L24 The definition of abbreviations T1 and T2 should be put rather one line above at the first occurrence of terms Tier 1 and Tier 2

P2/L3 I would add “model” between “additional” and “sensitivities” to make sure that the sensitivities studied here may well be model-dependent (as the authors rightfully acknowledge at a later occasion in their manuscript).

P2/L9 Would it be appropriate to reformulate “This leads onto” to “This leads to descriptions of”?

P2/L11 I would add a “section” after “results”, and do not capitalize “Atmospheric”. Furthermore, I think it would be helpful if the authors clarified their text to specify what they mean with “Atmospheric and surface climatology”. As it apparently only focusses on the atmosphere part, as the ocean realm is listed subsequently, also the surface climatology appears to be related to the atmosphere. Do the authors mean: “atmosphere circulation and surface climatology”? Last but not least, I would add an “focussing on” between “then” and “the”.

P2L14 Capitalize “Pliocene Model Intercomparison” and avoid repetition of the term “was used” from the line before. Furthermore, I would put the abbreviation CMIP3 in brackets after the definition, rather than the other way around.

P2L15 I would clean up the text “IPCC AR4 Solomon et al. (2007))” to ([…] contributing to the IPCC’s AR4; Solomon et al., 2007).

P2L16 Change (IPCC AR5; Flato et al. (2013)) to (IPCC AR5; Flato et al., 2013), and add a comma at the end of the line.

P2L17 There is an apostrophe missing in “model’s”.

P2L18 Could the authors please define in the text what they mean with “similar generation models”? I would reformulate the text “suited to long-integration palaeoclimate studies” to “suited to conduct long-term integration palaeoclimate studies”.

P2L21 I would add an “and” before “these”.

P2L22 The sentence starting in this line is awfully long. Maybe one could remedy this by at least staring a new sentence after “Pliocene” in this line.

P2L24 I believe for the term “Panama seaway” both constituting words should be capitalized (i.e. Panama Seaway)

P2L27/28 There seems to be a problem with the sentence “This body”. Does “record of” need to be replaced with “record where”?

P3L7 Add an “at” between “and” and “45°”. Add a comma before “respectively” if needed.

P3L9 Add a space between “CH4” and “760”

P3L10 I would add “as reference” after “PMIP2” in order to clarify the meaning of the sentence.

P3L13 The statement “based upon the modern” is not clear to me and should be clarified. Do the authors want to say “based on modern climatological conditions”?

P3L18 There is one occasion where a comma clarifies the magnitude of the number (1,371), but this is done nowhere else. Please harmonize.

P3L19 A statement similar to P1/L17 holds, i.e. maybe reformulate to “of the choice of the TSI value”.

P3L22/23 Maybe reformulate to “if the group is a participant in CMIP6”.

P3L24 Add a comma after “AMOC strength”.

P3L25 Put the abbreviation MOSES2.1 into the bracket rather than the full specification of the term

P3L26 Do not capitalize the terms “broadleaf” and “needleleaf”.

P3L28 Change “through” to “throughout”. Furthermore, I would argue to move the description of the handling of vegetation rather to the description of the experiment design somewhere in section 3.

P3L29 Delete the comma after “subsurface”.

P4L5 I would change “([…] grid) giving 6 grid cells” to “([…] grid), equivalent to six grid cells”.

P4L9 Capitalize “Archipelago”

P4L10 Add a comma after “region”.

P4L11 change “mixing; important for the” to “mixing that improves the”.

P4L12 I would reformulate the sentence to “No similar scheme is present for ...”.

P4L17 The meaning of the term “virtual -ve salinity fluxes” is not known to me. Could the authors please elaborate and/or provide a reference to a definition?

P4L19 Change “artificiality” to “artificially”.

P4L25 Replace the hyphen of “high-latitudes” with a space.

P4L27 add “on the other hand” after “rigid lid scheme”.

P4L30 A hyphen between “Observation” and “derived” would clarify the meaning of the sentence.

P4L33 Replace “is” by “are”.

P4L34 Fix the typos in “parameterisation”. I believe a “of” is missing after “the action”, a “a” is missing before “parameterisation” at the end of the line, and “is” should be replace by “are”.

P5L1 I think the “and” should be replace by a comma.

P5L4 Pluralize “experiment”.

P5L4/6 I would separate description of the Pliocene simulations from the sensitivity studies for clarity. That means, I would start a new sentence after “PlioMIP2 protocol” where I describe the sensitivity study.

P5L8 Add “consideration of” after “o and i indicate”. Furthermore, start a new sentence in the following line 9 for clarity.

P5L9 Add an “(o)” after “The former” for clarity.

P5L10 Replace “giving” by “providing”. Add a “the” before “PlioMIP2”. Furthermore, I think the statement “PlioMIP2 experiment design” should rather read “PlioMIP2 simulation ensemble”.

P5L11 Maybe replace “sensitivity outside” by “sensitivity study that is beyond”.

P5L12 Remove “the” before “standard”. Add “the subscript” before “*orb*”.

P5L13 Add “sensitivity studies” after “total solar irradiance”.

P5L15 Should the bracket at the end of the line rather read “(e.g. Eoi280 vs. E280)”, 280 being a superscript?

P5L16 Similar to my statement above, can simulation E400 and E560 really be considered “pre-industrial”, and should the heading be rephrased accordingly?

P5L17 Pluralize “year” in the bracket.

P5L18 I believe “Levitus” should read “Levitus’”.

P5L20 Add a “runoff” at the end of the line to make clear that the text refers to runoff basins (rather than ocean basins).

P5L23 Change “is 280” to “are 280”.

P5L24 Use the before defined abbreviation TSI rather than the full term.

P5L25 I think the experiment naming only makes sense if the two appearances of the string Eoi250-450 are replaced by Eoi250‚450

P5L30 Capitalize “Pliocene”.

P6L5 I would add “regions of the” before “Eurasian Arctic”.

P6L6/7 I would reformulate “the MOHC developed pre-industrial boundary conditions” to “the pre-industrial boundary conditions developed by the MOHC”. Add “to implement” between “we” and “omit”. Should the term “subaerial extension” rather read “subaerial exposure”? Maybe add “Pliocene” between “the” and “Strait”.

P6L8 Maybe replace “the same as” by “identical to the”, and add a “Strait” after “pre-industrial”.

P6L9 I think a hyphen is necessary in “model-resolution” in order to clarify the sentence.

P6L10 The term “using similar methodology” is unclear to me, please elaborate in the text.

P6L13 Rephrase “manual correction in corrected regions”.

P6L14 Does “new” orography mean “Pliocene” orography?

P6L15 I think hyphenizing “model-resolution” improves the clarity of the sentence.

P6L17 A hyphen is missing in “model‚s”

P6L21 Do not capitalize “island”.

P6L24 I would add “(Section 3.2.1)” after “aforementioned” for clarity.

P6L27 Switch word order of “represent fully”.

P6L30 The authors state that “Within PRISM4, 8 islands have been specified.” I think this is misleading, as the specification is only true for their model setup, not for the entirety of PRISM4. One could rephrase: “Within the PRISM4 model setup, 8 islands have been specified.”

P6L31 In reference to aforementioned comments regarding the term pre-industrial for the various simulations with pre-industrial geography: change “within pre-industrial HadCM3 experiment” to “within the pre-industrial HadCM3 geography”.

P6L32 I think the reference to Section 1.1 is wrong and should rather be to Section 2.2.

P6L34 Do not use “condition” in the plural form. The term “we will not see” sounds a bit informal and could be replaced by “our simulations do not resolve”.

P7L1 “[…] when we look at climatological anomalies”: Is this not also true for the understanding of absolute quantities? Please clarify and correct (omit) if necessary.

P7L3 Add a “from” after “as well as”.

P7L4 The term “rigid lid” is misspelled.

P7L5 Should the term “channels” be replace by “gateways”, as the aforementioned bathymetric features are rather known as gateways?

P7L8 Do not capitalize “atmosphere”.

P7L9 Add “as well as” before “pre-industrial CO2” for clarity.

P7L10 Should the term “sea ice” rather read “sea ice distribution” or “sea ice compactness”, as this is the likely quantity to which the model was constrained?

P7L12 Omit “the” before “river scheme”, and consider to replace “Here” by “So far”.

P7L16 Consider to omit “then”. Should the “(1.” be there? Maybe replace “we have an” by “we employ”.

P7L17 Start a new sentence after “barotropic physics”.

P7L18 I think the “vegetation boundary conditions” should be rather singular.

P7L20 Should the sentence read: "… of the Antarctic Peninsula to resolve a persistent and unsatisfactory model artefact in this region?" What was the artefact?

P7L21 Does fixation of CO2 need to be stated again (after the previous explanation)? Add a "model" before "year".

P7L22 Maybe remove brackets and make the content a subordinary clause preceded by a comma. Add a "Pliocene" after 8, as there are more simulations than just 8.

P7L23 Should the text read "… the final 100 years producing the full climatological output"? Replace "is" by "are".

P7L24 Consider to add a "producing" before "climatological averages".

P7L25 Are there really 10 Pliocene simulations presented, or rather 9?

P7L26 This is a minor thing, but it is not clear to me from the description of the spinup procedure to what the 7000 generated model years refer. Certainly not to the fact that each simulation has been integrated over 7000 model years? Consider to replace "giving" by "producing", and fix the unit Tb (to TB).

P7L27 Move "achieve" (in plural form) to before "with".

P7L32 The sentence could be clarified by changing it to: "… and ocean potential temperature trends in the upper 200 m and globally integrated are ...".

P8L1 There is a superfluous space after "century^{-1}" and before the second appearance of $^{-1}$.

P8L2-3 I would clarify the sentence: "Positive TOA imbalance is indicative of a warming of the earth system", the small heat capacity of atmosphere and land means that residual energy is predominantly taken up by the ocean ...".

P8L4 Should the text read "volume-integrated" rather than "volume-averaged"? Add a missing space before "Warming".

P8L6 To clarify the meaning, should "and greater" be changed to "and deeper"?

P8L7 Could the authors elaborate what "All experiments are satisfactory." means, i.e. what characteristics of a simulation make it "satisfactory"?

P8L8 Should the word "inconsistent" rather be "impossible" or "not meaningful"?

P8L13 Should the heading be reformulated to, e.g., "Sate of the atmosphere and earth surface climatology"?

P8L15 I think in addition to Fig. 3 also Fig. 4 should be referenced here?

P8L17 I am not sure whether the term "ice sheet retreat" makes sense here, because with respect to pre-industrial the actual mechanistic change is not a retreat but an expansion. Maybe reformulate to "… regions where Pliocene ice sheets and the respective elevation are smaller than today. Typically ...".

P8L19 Is "is in a similar distribution to HadCM3" right, or maybe state "is similar to results derived with HadCM3"?

P8L24 (and at least one following occurrence): Does the abbreviation "UK" refer to "United Kingdom"? If so, personally I would consider to replace it with a non-political geographic terminology, as neither the UK, nor any other man-made political union, have been present during the Pliocene.

P8L25 Should the reference to Fig. 4 rather be to Fig. 3? Please check and correct if necessary.

P8L26 Replace "in the" with "at"?

P8L27 Replace the misspelling ("he") with the correct "the".

P9L1 Maybe put E280 in brackets.

P9L7 To make sure, that the reference is to Table 2 of Haywood et al. (2013), rather than to Table 2 of this manuscript and to the work by Haywood et al. (2013), replace the semicolon after "Table 2" by an "of".

P9L19 Consider to replace the hyphen by either “i.e.” or “e.g.”.

P9L20 Change “models” to “model’s”, and elaborate the “wet get wetter paradigm” (maybe with a reference to previous work).

P9L23 Is this result shown somewhere in the manuscript? If so then please refer to the respective Figure/Table.

P9L15 Change “is” to “are”.

P9L26 Could the authors point to where the extend of ~15° more eastward can be deduced from the results?

P9L27 Replace the comma before “Despite” by a dot.

P9L28 There is a problem with the sentence “. or extension into the South Atlantic is not present”. It seems that some information got lost here.

P9L30 There is one superfluous “the”.

P10L2 Please check whether the abbreviation SACZ is used further on (and hence whether it is needed).

P10L2/3 There is a need for commas, otherwise the sentence is misleading. Add commas after “increases”, after “eastern Brazil”, and after “to the west”.

P10L28 Switch word order of “stable latitudinally”.

P10L29 Remove the space before “ -E280” (also in line 31 and 34).

P10L32 Should the term “summer” hemisphere jet rather read “southern” hemisphere jet? I am not sure.

P11/L1 (and various other locations): The term “equaterward” should read “equatorward”.

P11L2 Should the reference be to Fig. 6 e and f?

P11/L3 Would it make sense to reformulate the heading to: “Ocean state: Description of large scale hydrography, circulation patterns, overturning, and ocean heat transports”, omitting the dot at the end? The heading is overly long though, and should maybe be shorted for the final two-column layout of the published manuscript.

P11L8 Maybe add a hyphen to change to “CO2-induced”.

P11L9/10 The sentence is incomplete and needs to be completed.

P11L25ff Various changes:

1.) “in the geographic and CO2 sensitivity of seasonal sea ice” to “in the sensitivity of seasonal sea ice to geography and CO2”.

2.) “northern hemisphere winters” to “Northern Hemisphere winter”

3.) “paleaogeographic” to “paleogeography”

4.) is the vegetation change not already included in the geographic change, and hence the term is superfluous here?

5.) change “expansion of sea ice extent” to “expansion of sea ice”

6.) change “suppresses” to “suppress”

P11L30 I think commas are needed here: “Generally, as we increase CO2,”.

P11L31 Remove “ice” before “concentration”.

P12/L6ff Add a “the” before “HadCM3”. Add an “s” to “occur”. Capitalize “Greenland Seas”. The text “off of the island Antarctic Peninsula” could be changed for clarity.

P12/L14 Add “AMOC of” after “the observed”.

P12L15 Add either a comma or a “from” between “N” and “Apr”. Definition of the unit of Sverdrup is wrong (it should be $m^3 s^{-1}$). Replace “differs to” by “differs from”.

P12L30 I would reformulate to “… level (for simulation Eoi400 the circulation pattern is 22% and 6% stronger ...”.

P13L3 Fix the transect definition: 64.375 – 56.875°S, 65°W

P13L4 Should “positive aspect” rather be “positive range”?
P13L7 Consider to replace “had an” with “simulated an”.
P13L9 Remove the “s” from “gradients”.
P13L10 The statement, that overly strong salinity gradients are present across the ACC in particular on the equatorside: should “on the equatorside” be replaced with “towards low latitudes”?
P13L14 Remove the double t from “interpretting”.
P13L16 Add an “of” before “barotropic nature” and switch word order of “island Peninsula”.
P13L18 Add a comma after “line-integral configuration”.
P13L19 Start a new sentence after “a solution”, or add a hyphen.
P13L21 Replace the comma in the bracket by a “to”, and fix the typo in “latitutudinal”.
P13L22 Change the word order to “and an equatorward shift of its centroid”.
P13L29 Add “in the Pliocene” after “continuous counter current”.
P13L33 Provide consistent capitalization with respect to “Weddell sub polar gyre” and “Ross Sea Gyre”.
P13L29ff The text of page 13, lines 29 to 34, and of page 14, lines 1 to 7, seems to be a duplicate (with the exception of some additional information in the repeated version of the text). Combine the two texts to avoid repetition. The reference to Section 11 in the second version appears to be erroneous.
P14L9 Add a space after “modern”.
P14L10 Change “Tab. 6 SST” to “Tab. 6 MASST”
P14L11 Please explain what you mean with “warm pool dynamics”. Furthermore, is there a “significant” missing after “statistical”? Remove the superfluous space in the subscript of AMOC_max.
P14L12 Add a degree sing before “N”
P14L8 Abbreviation TSI has been defined before.
P14L23 I would change the text to: “for simulations based on 1365 and 1361 Wm^{-2}”.
P15L5 You refer to “climate and ocean state”, which seems to be redundant as the ocean is part of the climate. Do you rather mean “atmosphere and ocean state”, or only “climate state”?
P15L10 Add a “results of” between “to” and “PlioMIP”.
P15L12 Reduce “1.90” to the correct number of significant digits.
P15L13 Add “of these quantities” after “an insensitivity”.
P15L18 add an “in” after “than”, a comma after “pre-industrial”, and “the variation” before “driven”.
P15L19 Does on also need to consider E280 in comparison with Eoi400 and Eoi280 towards determination of the statement? Please clarify and add reference to E280 if necessary.
P15L34 Add a comma after “KM5c”.
P16L10 Add a comma after “grid type”.
P16L16 Change “subariel” to “subarial”.
P16L23 Please elaborate what you mean with the statement “associated with the maritime continent”.
P16L30 Fix the formatting of the hyperlink.
P17L9 Add a dot at the end of the line.
P18L5 There is a typo in the name of author Peterschmitt
P18, L16 The bibliographic information to the publication by Cox (1984) seems to be incomplete. Is there a link for downloading the text?
P18L18/19 The DOI is duplicated.
P18L21 Add missing page information.

P18L25 Remove space around hyphen in page numbers.
P18L31 Something is wrong with the author names “Dolan, A. M., M, H. A.”.
P18L34 Could you provide page numbers and DOI?
P18L35 Replace the “?” by a hyphen. Furthermore, should the format of Guilyardi et al. (2013) should be adjusted to meet the requirements of an “in-book” publication?
P19L5 Add page numbers.
P19L10 Fix problems with the formatting (&#x).
P19L11 Is the string “20120 515” correct?
P19L16 Remove space around hyphen in page numbers.
P19L18 Add page information.
P19L20 Is there a download link to the publication by Li and Shine (1995)?
P19L28 Add page information.
P19L34/35 Should one adjust the format to in-book?
P19L36 The bibliographic information to Semtner (1974) appears incomplete.
P20L1 Remove space after “Basis”, before colon. Is the reference format correct?

References:

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