Response to reviewers

We thank the reviewers for their positive and constructive reviews. We have two points which were questioned by all reviewers, which are addressed in the "General" section below and then proceed to answer the reviewers point by point.

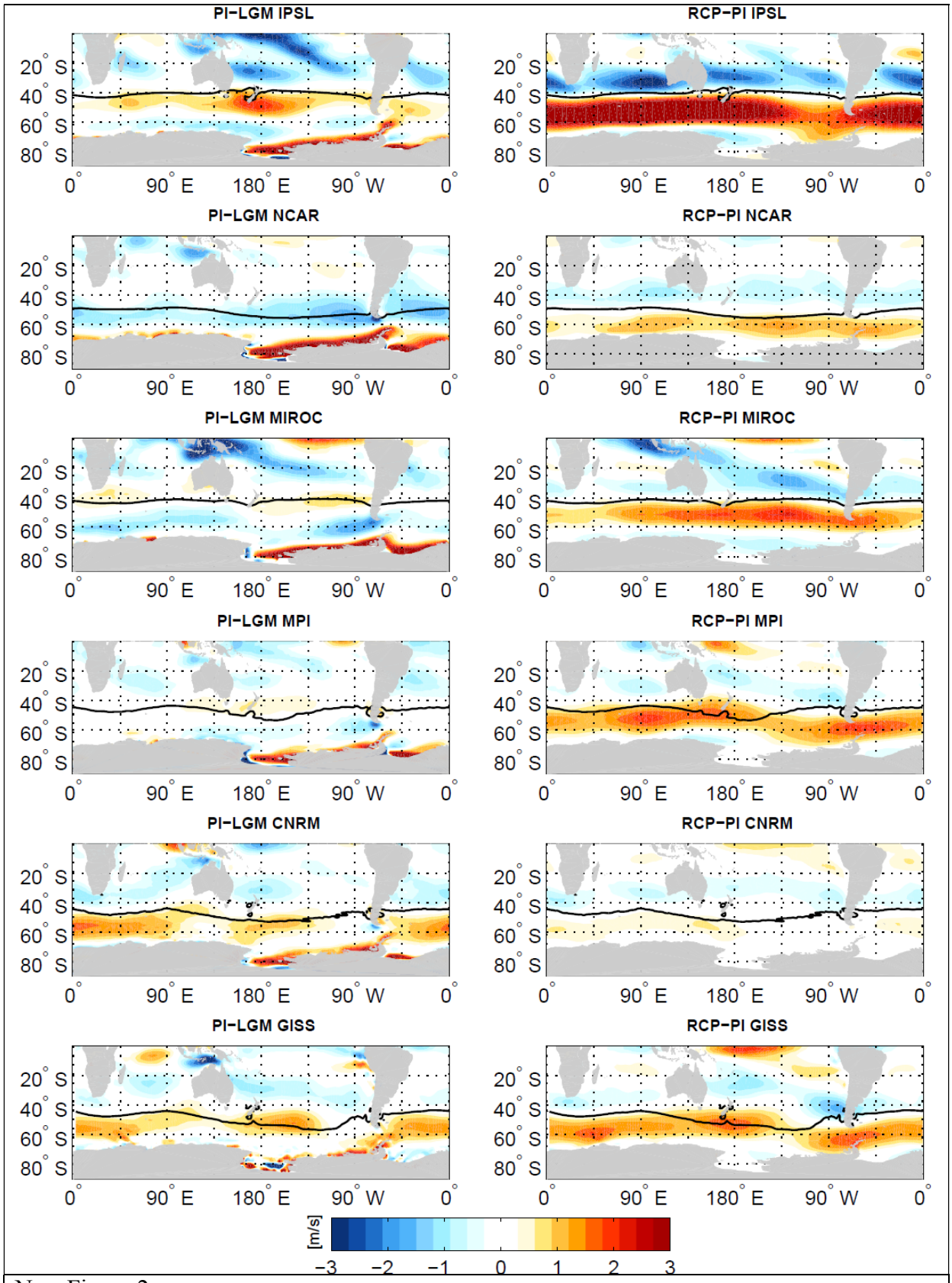
General:

A. Figure 2, wind changes.

Following suggestions by the reviewers, Figure 2 (showing maps of the future and past wind changes over the Southern ocean at 850 hPa) has been redone with the following changes:

- The blue / red lines (showing the mean jet position at the LGM and future, respectively) have been removed: they were hard to read and mostly added confusion.
- The color scale has been tightened, to make the anomalies for most models stand out more.
- Continents have been shaded with light gray, as a lot of the signal was due to spurious large anomalies linked to interpolation below the orography.

The new figure is shown below.


PI−LGM IPSL
RCP−PI IPSL
PI−LGM NCAR
RCP−PI NCAR
PI−LGM MIROC
RCP−PI MIROC
PI−LGM MPI
RCP−PI MPI
PI−LGM CNRM
RCP−PI CNRM
PI−LGM GISS
RCP−PI GISS
20° S
40° S
60° S
80° S
0°
90° E
180° E
90° W
0°
[m/s]
−3
−2
−1
0
1
2
3

New Figure 2

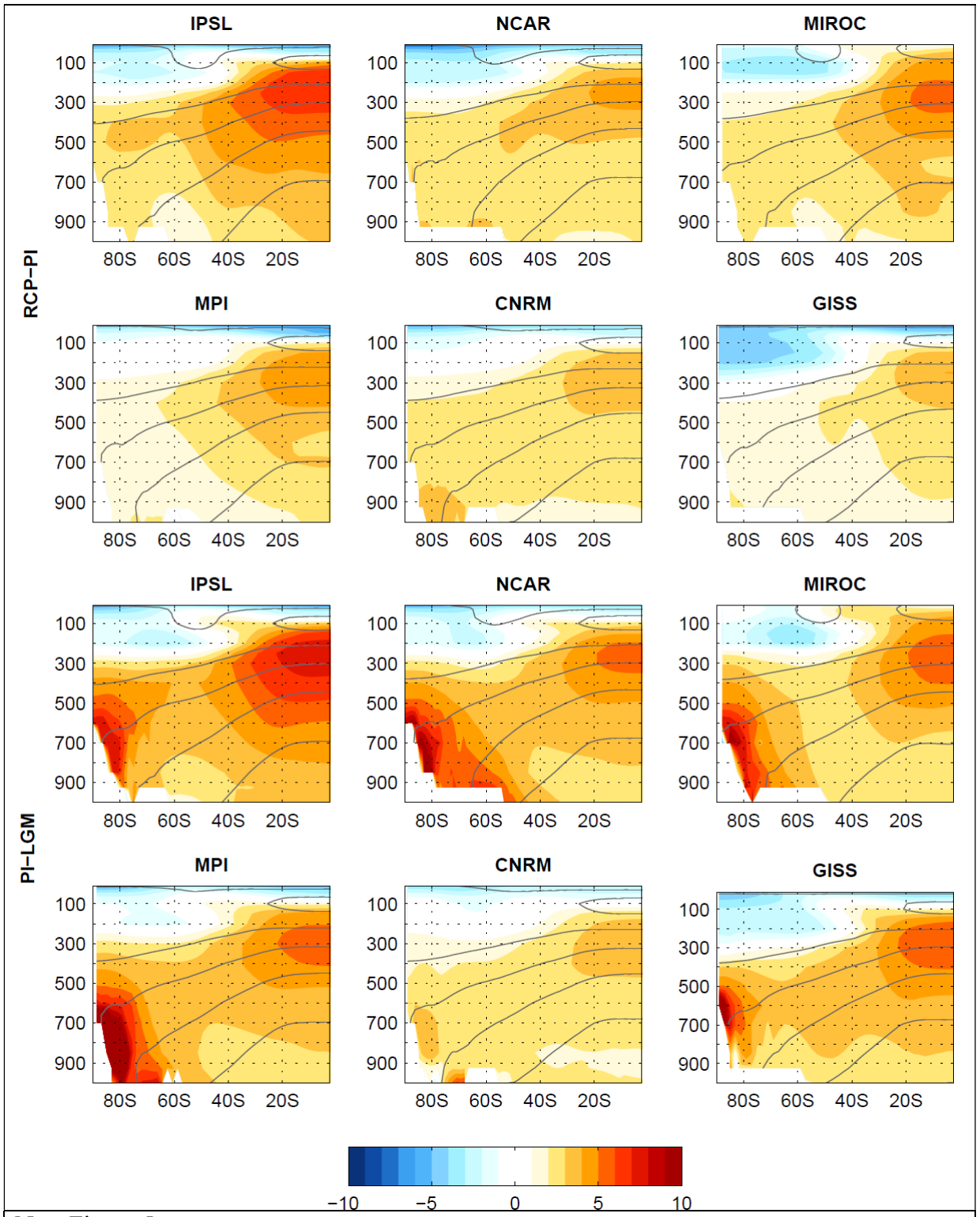
The position of the jet (latitude of maximum wind) was computed with a quadratic interpolation using grid points around the one of maximum mean wind. This has been precised in the text.

B. Mean temperature changes

Figure 5 (showing latitude-pressure cross-sections of the zonal-mean temperature changes) has been redrawn with the following changes:

- As asked by several reviewers, the panels have been reorganized to group future changes on top, and past ones at the bottom, instead of grouping by model.
- Grid points below orography are treated in an inconsistent way in the different model outputs, with some having missing data and others extrapolating from above. To apply a consistent treatment and plotting, we put all data at pressure levels below the local surface pressure to missing value.

This new figure 5 is shown below.



New Figure 5

Note that the latter treatment of missing values was already used for computing indices of temperature averaged over the polar or tropical regions, there is thus no change in these results.

Response to reviewer 3 (Editor)

I feel that the most substantial point to address is that of the differing treatment of Antarctic orography. Reviewer 2 raises this issue when talking about figure 5, and I have spotted something similar on fig. 2. Although this could be a non-issue, it has the potential to be caused by e.g. mislabelling of the CMIP data files with important consequences for your work.
The treatment of missing values under orography was not homogeneous in the plotting of zonal-mean anomalies on figure 5, but was correct in the computation of temperature averages used for polar / tropical indices: all values below surface set to missing.
We redid Figure 5 with correct plotting (see main point A).

The point about further defining the location of the jet-stream by Referee 1 is also brought up Referee 2 in their question about the existence of multiple jets in fig 2, so I feel that this must be clarified.
Figure 2. The way the missing data is handled seems a little strange (i.e. the blue contours around the Andes). Perhaps doing a block fill in gray would help differentiate these regions from those with little change.
We clarified the definition of the jet latitude from the time and zonal average in section 2.2.

We kept only the PI jet on figure 2, so there are no more issues with distinguishing the color and apparent multiple jets. We also filled the continents in gray, although some large wind changes around Antarctica remain in PI-LGM close to the larges orography changes.

Figure 3. The titles should be on the X-axis and include units. Then the caption could be made such that you don't need to read the associated text.
Titles on that figure now include units.

Other technical comments were corrected.