Response to Referee Comments for egusphere-2026-044:
Towards Constraining the Drivers of Variability and Trends in Subantarctic Productivity

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General response to RC2
Reference 2 is wholeheartedly thanked for their positive feedback and highly constructive comments towards the improvement of the manuscript.

We have revised the arrangement of CMIP6 results, moving the novel analysis from the discussion to the results section with corresponding text amendments, and moving the CMIP6 NPP trends to the appendix.

Our detailed response is given below. Line numbers referenced in author comments refer to lines in the revised manuscript.

Referee Comments 2:

Suggested revisions
Data availability and reproducibility
I checked the data availability and analysis code. With the exception of the PISCES-QUOTA-FE output, all datasets and code appear to be accessible. The PISCES-QUOTA-FE output is currently listed as restricted access on Zenodo. To ensure full reproducibility of the study, it would be important for this dataset to be made publicly available prior to publication.

Owing to institutional funding and project alignment obligations, the PISCES-QUOTA-FE output data is available on reasonable request from co-author Tagliabue.

Placement of the CMIP6 results
While the methods and results are clearly presented, and the findings are effectively discussed in Sections 4.1 and 4.2, I found the placement of the CMIP6-related results somewhat unusual. Figures 8–11 are presented within Discussion Section 4.3 rather than in the Results section. This makes the narrative more difficult to follow and, in my view, disrupts the overall flow of the manuscript. I suggest moving the CMIP6 analyses and associated figures to the Results section and using Section 4.3 to synthesize the findings from the satellite products, the biogeochemical model, and the CMIP6 projections.

Figure 10 results (CMIP6 NPP trends) have been moved to the appendix and are cited now as Figure A8. Figure 11 (CMIP6 bootstrap analysis) has been moved from the discussion to a new results section (3.5). We have added further text in the results section 3.5 and discussion section 4.3 to more comprehensively incorporate CMIP6 results and the application of our statistical methods into the manuscript:

> **Revised Manuscript Lines 439 - 455:**
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> ***"3.5 – Environmental drivers of subantarctic NPP in CMIP6 models***
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> In the highest NPP years, increased SSTs and more southern STF position were generally consistent across the whole year across ACCESS-ESM1.5, CanESM5-CanOE, CanESM5-CMOC, CESM2 and CMCC-ESM2 models, suggesting that thermal drivers dominated highest NPP years for this subset of CMIP6 models (Figure 8c). In PISCES-v2 containing models IPSL-CM6A and CNRM-ESM2-1, SSTs were only significantly warmer from July to

October (Figure 8c), which opposes our findings of cooler SSTs in PISCES-QUOTA-FE assessment (Figure 4c). Despite generally warmer SSTs, the significant differences between highest and lowest NPP year groups in CMIP6 models were variable, with ΔNPP ranging from 2 to 40 mmol C m^2 d^{-1} (Figure 8a). The highest differences in NPP between highest and lowest NPP year groups were in CESM2 and lowest differences in ACCESS-ESM1.5, CanESM5-CMOC, GFDL-ESM4 and CMCC-ESM2 models (Figure 8a).

Between highest and lowest NPP year groups, ΔMLD was large and varied substantially across models (Figure 8b). Through winter and spring, ACCESS-ESM1.5 ΔMLD was significantly shallower than any other model, with ΔMLD values ranging from 100 to 300 m shallower. during high NPP years (Figure 8b), Deeper MLDs were significant for only CanESM5-CMOC in October, and IPSL-CM6A and CNRM-ESM2-1 in November (Figure 8b). IPSL-CM6A and CNRM-ESM2-1 use PISCES-v2 biogeochemical modules, and deeper MLDs in November are consistent with our assessment of PISCES-QUOTA-FE."

Revised Manuscript Lines 621-625: "This is particularly the case with variability between models in the direction of ΔMLD during high NPP years (Figure 8b) yet consistently increased ΔSSTs suggesting thermally driven NPP trends (Figure 8c). Moreover, broad variability in the difference between highest and lowest NPP years in CMIP6 models (Figure 8a) highlights that NPP response mechanism to warmer temperatures vary broadly."