

A central issue throughout the Results and Discussion is that several prominent changes relative to GCB 2024 arise primarily from methodological corrections (e.g. RSS corrections, revised ELUC treatment, updated GATM estimation), rather than from new observational constraints. While this distinction is carefully described in the Methods, it is not always carried through consistently into the Results and Discussion. I recommend that the authors more explicitly flag when differences relative to GCB2024 are driven by revised assumptions or corrections, especially when discussing the important differences relative to GCB2024 (particularly in ocean uptake, land–ocean partitioning, and budget imbalance)

*Thank you raising this point. At the beginning of the ocean sink and land sink results sections, we now remind that the reported estimates of SOCEAN and SLAND are corrected, as described in the method section. We also report the values of the uncorrected estimates are for the last decade (2015-2024). Likewise for the BIM estimate for the last decade, we also report the BIM estimate with uncorrected SOCEAN and SLAND.*

The exceptionally large atmospheric CO<sub>2</sub> growth rate in 2024, combined with a strongly negative budget imbalance, is a key result of this update. While the manuscript discusses this clearly, parts of the Discussion imply causal attribution (e.g. sink overestimation or sink failure) that is not uniquely supported by the budget closure alone. Given that multiple budget components (SLAND, SOCEAN, and GATM) were revised simultaneously, and that correlated uncertainties remain substantial, attribution of the imbalance to any single process is inherently ambiguous. Statements linking the 2024 imbalance to specific sink behaviour should therefore be softened or explicitly framed as hypotheses rather than conclusions.

*Thank you for this suggestion. The 2024 budget imbalance is large: -1.7GtC. This is too large over one single year to be due to an underestimation of the anthropogenic fossil or land use changes CO<sub>2</sub> sources that do not show such large year to year variability. Similarly, the ocean sink does not vary significantly from one year to another. The culprits must be the land sink or the CO<sub>2</sub> growth rate. Given the discrepancy between the land sink estimate from the DGVMs and atmospheric inversions, we have strong reason to believe the imbalance comes from the land sink estimate (as now discussed in section 3.8.1.1). Nevertheless, we added a mention of the uncertain CO<sub>2</sub> growth rate in 2024, revising the statement in section 3.9.1 and writing : "For 2024, the combination of our estimated anthropogenic sources ( $11.6 \pm 0.9 \text{ GtC yr}^{-1}$ ) and partitioning in atmosphere, land and ocean ( $13.3 \pm 0.9 \text{ GtC yr}^{-1}$ ) leads to a large negative BIM of -1.7 GtC (Table 7), indicating that, despite the lower than average SLAND in 2024, the land sink is still too large to explain the record-high atmospheric CO<sub>2</sub> growth rate of 2024. We note that using the GRESO atmospheric growth rate of  $6.8 \pm 0.2 \text{ GtC yr}^{-1}$  for 2024 (Section 3.5.3) would reduce the BIM to about -0.6 GtC."*

Minor:

Please explicitly remind us readers that changes in ELUC relative to GCB2024 arise from revised model assumptions (transient carbon densities), rather than new land-use activity data.

*Changes in ELUC this year results from the revised transient carbon densities indeed, but also from having 3 bookkeeping models this year vs 4 in GCB2024. The land cover forcing is*

*updated every year (to the most recent year), with potentially some, more minor revisions of previous years. This is explained in section 3.2.2 when the ELUC results are presented, with a reference to figure S1 and S3 for attribution of each change.*

When discussing the suspension of SOCAT-based products and applied corrections, a brief summary sentence reiterating the rationale would help non-specialist readers.

*There is no direct relation between the suspension of some ocean datasets in SOCAT and the correction applied to the SOCEAN estimate. They are both listed in Table 3 as both being methodological changes in this year budget GCB2025 relative to last year GCB2024.*

Minor inconsistencies remain in the use of terms such as “uncertainty,” “spread,” and “variability.” These could be harmonised for clarity.

*Thank you, we tried to be as consistent as possible. We use uncertainty when quantified with a standard deviation; range when quantified from less than 10 data streams (ESMs, fCO<sub>2</sub> products). Variability is used to quantify year to year changes.*

Specific Comments (please be aware that the line numbers refer to the manuscript with tracked changes which I kindly received from the editors)

· Lines 641–642 (Abstract): The large negative budget imbalance in 2024 is interpreted as suggesting that “the total sink or GATM is strongly overestimated”. From a mass-balance perspective, an equally plausible interpretation is that land carbon losses are underestimated. Processes such as drought-enhanced respiration, disturbance-related emissions (e.g. fires, peat), and post-disturbance legacy fluxes are not fully constrained and would lead to an apparent negative imbalance. I suggest rephrasing (briefly in the abstract and in more detail in the main text) to explicitly acknowledge underestimated sources or land carbon losses as an alternative or additional explanation.

*At the abstract level, we believe it is OK to say the sink is overestimated. The sink is the net result of carbon gains and losses, with gains being larger than losses both for the land and the ocean. Saying the "net" flux (the sink) is too large does not imply the gains are overestimated. It could indeed be the losses that are underestimated. This is discussed in more details in sections 3.7.3. Post disturbance legacy fluxes are unlikely to play a major role for one year only.*

· Line 1047: The sentence “Global emissions and their partitioning among the atmosphere, ocean and land are in balance in the real world” is potentially misleading. I suggest rephrasing

*We are not sure why this could be misleading. The sentence described the mass balance (conservation of carbon globally). We now write "mass balance" hoping this was the issue.*

· Lines 1222–1236: Please add a reference to the description of how aviation and shipping emissions are estimated and projected.

*For the historical estimate, the reference is given: Andrew and Peters (2025). For the projection, they are estimated in this GCB paper. The method is briefly explained in section 2.1.2 with a more detailed description in the SI, section S.1.5*

· Lines 1745–1747: Please add a reference to support the statement introduced here.

*We are not sure which statement the referee refers to. The statement line 1745 has 6 references already: (Gitz and Ciais, 2003; Sitch et al., 2005, Pongratz et al., 2009; Gasser et al., 2021; Obermeier et al. 2021; Dorgeist et al., 2024).*

· Lines 2626–2627: Please provide quantitative values (absolute and/or relative) for the reported increase in CO<sub>2</sub> emissions due to peat fires in tropical Asia.

*We have added the estimates: "Emissions are further increased by peat fires in equatorial Asia (GFED4s, van der Werf et al., 2017), contributing substantially to emissions in individual years, typically related to dry conditions during El Niño (0.2 GtC in 2015; 0.03 GtC yr<sup>-1</sup> averaged over 2015-2024)."*