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Biogeosciences Discussions

Interactive comment on "Direct and indirect metabolic CO_2 release by humanity" *by* Y. T. Prairie and C. M. Duarte

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Response to reviewer #1

The two main points raised by reviewer #1 are that we fail to provide an estimate of uncertainty on both the direct and indirect metabolic CO2 emissions and that we did not discuss sufficiently whether these emissions should be considered net emission or simply rapid recycling. While both of these concerns are legitimate, we address them below to show that the original thrust of the manuscript remains valid and unchanged. However, we agree that more details on the calculations and on the interpretation of how these emissions fit in the global carbon budget will be necessary in the revised manuscript.

All direct and indirect estimates of CO2 emissions were made using standard allomet-

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ric equations. For homeotherms, these relationships carry an inherent uncertainty of about 0.1 log units for any given species (Robinson et al, 1983), or equivalent to a coefficient of variation of about 25%. We assume here that the average body weight of individual species is known accurately. If we assume further that number of individuals obtained from the FAO statistics are precise only to within 20% (as coefficient of variation), the compounded uncertainty of the emission of any given species reaches 32% . When the statistical uncertainty of 32% is applied to all 13 species considered, the summed emissions amounts to a smaller relative uncertainty of about 17% . This figure represents the expected uncertainty on the global emissions of direct and indirect human-derived metabolism.

For human respiration, we also estimated the per capita rate as the product of average breathing frequency (10 min-1), tidal volume (0.5 L) and average CO2 concentration (3.5%) (Marrieb 2000), yielding an average individual rate of about 251 g CO2-C d-1 , nearly identical to the estimate of 257g CO2-C d-1 derived strictly from allometric relationships. The similarity of these two estimates strongly suggest that the allometric approach gives reasonable values.

With regard to whether human metabolic emissions should be considered net emissions or not, we had mentioned in the original manuscript that these emissions represent an accelerated recycling mechanism (“ This is likely because anthropogenic metabolic CO2 release may be considered just an intensification of cycling process between the atmosphere and the biosphere via enhanced crop and pasture production. ”). However, because this same issue was raised in some way or other by the three reviewers, it clearly shows that we did not explain this sufficiently, which we will do in a revised manuscript. The main point of this manuscript remains that the magnitude of this recycling mechanism is far from insignificant, much larger than previously imagined. In an equilibrum situation, the magnitude of this recycling is not particularly important to the net balance of the processes. However, because it is rapidly changing due to demographic increase, we suggest that the net role of this human-induced

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metabolic CO2 release may not be negligible either and that awareness of the importance of this pathway is required to devise strategies that are effective in reducing total antropogenic CO2 emissions. The revised manuscript will incorporate more details of this argument.

1. Estimated from error propagation analysis. 2. Estimated as the sum of individual variances and expressed as CV.

Interactive comment on Biogeosciences Discuss., 3, 1781, 2006.