

Point-by-point response to the editor's comments

Thank you very much for the thorough revision of the manuscript. All reviewer comments were addressed appropriately, and the manuscript has been revised accordingly. One point, however, remains unclear: what was the rationale for selecting a 20-year period for the comparison of time intervals instead of the 30-year period suggested by the reviewer? A brief clarification on this choice would be helpful to ensure full transparency and strengthen the methodological justification.

Thanks for your thoughtful advice, and we apologize for not clearly explaining the rationales behind selecting a 20-year period. Our goal is to quantify the differences in nitrogen (N) flows related to lateral transfer and transformation between a period with limited human influence and one with strong human impact. Our results (Fig. 6), along with estimates from other models (Beusen et al., 2016a; Seitzinger et al., 2010), indicate that N flows related to lateral transfer and transformation have increased rapidly since 1960. This increase is primarily driven by anthropogenic activities (e.g., fertilization, manure application and sewage) rather than climate change (Beusen et al., 2016; Yao et al., 2020; Van Meter et al., 2018). As shown in Fig. 6, N flows related to lateral transfer and transformation exhibited a significant increased trend during 1985-2014. Using an overly long averaging period to assess N flow changes would dampen the magnitude of these changes. Considering these factors above and the reviewer's suggestions, we chose a 20-year period for the comparison of time intervals instead of the 30-year period suggested by the reviewer.

We have added relevant explanation in section 3.3.2.

“In this section, we examine the spatial distribution of contemporary N flows, and their changes compared to the early 20th century. Given the rapid increase in N flows since 1960 and the interannual variability induced by climate, we use the 1995-2014 average to represent contemporary N flows and the 1901-1920 average to represent early 20th-century conditions.” (Lines 632-636)

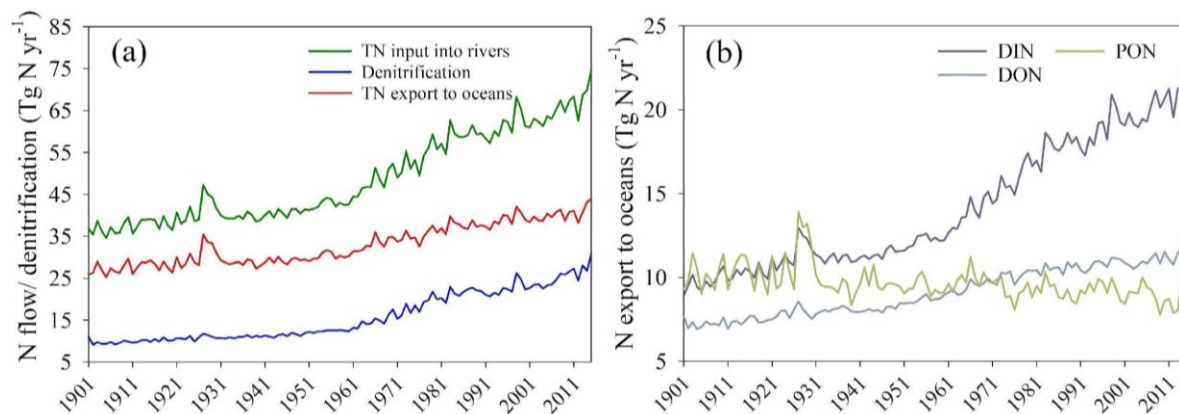


Figure 6. Trends in global N flows from 1901 to 2014: (a) yearly mean TN inputs into rivers, TN exports to oceans and denitrification rates; (b) yearly mean DIN, DON and PON exports to oceans. TN: total nitrogen; DIN: dissolved inorganic nitrogen; DON: dissolved organic nitrogen; PON: particulate organic nitrogen.

References

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