

## ***Interactive comment on “Photochemical mineralisation in a humic boreal lake: temporal variability and contribution to carbon dioxide production” by M. M. Groeneveld et al.***

**Anonymous Referee #2**

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General Comments: The role of photochemical oxidation of DOM in natural waters in releasing CO<sub>2</sub> has been studied since the 1980s. However, many questions remain regarding the nature of the process and its rates – the latter of which the present study addresses. Their study reports valuable findings on the high seasonal variability of the apparent quantum yield (AQY) that is an integrated index of wavelength-specific photochemical reactivity of DOM. By making monthly experimental measurements of AQY in a humic Swedish lake and running photochemical rate modeling exercises, they conclude that the photochemical production of CO<sub>2</sub> is a minor fraction of the overall CO<sub>2</sub> production in humic Swedish lakes that is presumably dominated by biological respiration. Advancing the discussion of these findings to low-latitude lakes with less

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seasonality and including considerations of loading of CDOM with variable reactivities based on the nature of the different biogeochemical backgrounds of their watersheds would enrich this study. Details: Title: The title describes the subject well, but reveals nothing of the findings. Suggest changing the later part of the title as follows: “large temporal seasonal variability with minor contribution to CO<sub>2</sub> production”. Abstract: Good. Introduction: Nice introduction to the problem. Methods: Sufficient detail is given. Results: Results are well presented, and I have no suggestions to make here. Discussion: Nice discussion points. Advancing the discussion of these findings to low-latitude lakes with less seasonality and including considerations of loading of CDOM with variable reactivities based on the nature of the different biogeochemical backgrounds of their watersheds would enrich this study. Furthermore, a simultaneous study of both ecosystem respiration and photochemical oxidation rates would have been very helpful. The authors should at least attempt a literature review – perhaps in the shape of a Table and discuss the take home message and how it relates to the current study. Refs: O.K. I consider this work to be of considerable interest to the readership of BG. The overall approach has merit, and these experimental measurements covering seasonal variability and modeling of photochemical mineralization of DOM reveal lower than expected rates of photomineralization of carbon, help advance our understanding of photochemical reactivity of DOM in natural waters and brings better context to its diminished but still important role in the carbon cycle of Earth’s watersheds. I suggest revision including a more robust Discussion of the findings as noted above.

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