

## ***Interactive comment on “Belowground in situ redox dynamics and methanogenesis recovery in a degraded fen during dry-wet cycles and flooding” by C. Estop-Aragonés et al.***

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### Referee 1 General remarks

It was a pleasure reading the manuscript; it was well written, and the results/discussion were presented in a logical and coherent manner. The study is well within the scope of the journal. The authors analysed/compared changes in the redox processes (sequential reduction, and subsequent re-oxidation of soil substrates) during drying, rewetting, recovery from rewetting, and flooding. There is considerable variability in the measured parameters (e.g. Figures 13 & 14) within the control and amended sites, respectively but this is to be anticipated in the field.

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Specific remarks Page 11675, Line 25; Page 11679, Line 15: It is not unusual to detect methane production while sulphate is still present as observed in this study. The authors attributed this observation to the presence of microenvironments in the peat, and indeed, it does seem like a likely explanation. Perhaps, the authors could discuss more, and provide references on studies showing the availability of such microenvironments instead of circumstantial evidence (e.g. previous studies by the lab Ecologie Microbienne, Claude Bernard University, Lyon, and recent studies – if published - in the lab of Prof. George Kowalchuk, Netherlands Institute of Ecology).

Page 11675, Line 17: Coming from a background in microbiology, and considering that methanogenesis is a microbiologically-mediated process, it is therefore a bit disheartening not to see more discussion on the effects of drying (aeration), and hence, oxygen toxicity on the methanogens. Some methanogens are remarkably tolerant to oxygen, as has been observed in recent environmental studies (Angel et al., 2012, ISME J; Kema et al., 2012, Appl Environ Microbiol).

Response: Both comments may be linked as point towards the same idea. We plan to include the reference (Angel et al., 2012, ISME) to emphasize the widespread tolerance of methanogens to oxygen as shown in worldwide samples from upland soils.

Page 11679, Line 1: Have the total plant biomass been considered as a potential source of acetate during the duration of the experiment? i.e. have the dry weight of plant material been measured in the different plots?

Response: We did not monitored plant or root biomass to evaluate the potential relation of plant-soil and release of exudates or acetate.

Technical corrections Page 11679, Line 23: ‘In addition to ....’ instead of ‘Additionally to ....’.

Response: This has been corrected.