Biogeosciences Discuss.,
doi:10.5194/bg-2015-641-RC2, 2016

Biogeosciences Discussions
Open Access
EGU

Interactive comment on "Effects of *in situ* CO_2 enrichment on structural characteristics, photosynthesis, and growth of the Mediterranean seagrass *Posidonia oceanica*" *by* T. E. Cox et al.

JAO Ott (Referee)

joerg.ott@univie.ac.at

Received and published: 15 February 2016

The manuscript by Cox et al. reports on an in situ experiment to study the effect of lowered seawater pH (ocean acidification) on a stand of the seagrass Posidonia oceanica in the Bay of Villefranche. The authors use a Free Ocean Carbon Dioxide Enrichment (FOCE) system, where pH can be controlled by CO2 addition. The methods are described in great detail and this section occupies a major part of the manuscript. The technical sophistication of the experimental set-up is admirable and great care was taken to ensure the proper function of all measuring devices used to record the numerous parameters. In this respect the work is a classic example of careful underwater experimentation. However, as a consequence of the necessary technical effort, the ex-

Full screen / Esc

Printer-friendly version

Discussion paper

periment remains without true replication, as the authors are aware. This drawback is aggravated by the fact that both the experimental and the control enclosure appear to have a distinct detrimental effect on the processes that should demonstrate the effect or lack of effect of acidification. In some cases the difference to the (not enclosed) reference plot is greater in the control than in the experimental treatment. This apparent stress could mask any effect (positive or negative) that the treatment could have. It is therefore daring to conclude that acidification has no effect on Posidonia. In parts the expectations of change induced by greater availability of CO2 appear a bit naïve. The life form of Posidonia resembles rather a “tree”, than a “grass”. With a life span of shoots of up to 50 years, as cited in line 611, little change in shoot density can be expected in an experiment lasting only 5 months. Furthermore, leaf growth is in part fueled by carbohydrate storage in the rhizomes, especially during the appearance of the new generation of leaves in fall and winter, rather than by photosynthesis alone (Pirc 1985 Marine Ecology, Pirc 1986 Aquatic Botany). The sequence of leaf appearance is probably an internal circannual rhythm (my paper in Mar. Biol. Letters 1, 1979). These properties may confound expected short-term changes and effects could possibly be found with a time lag after the end of the experiment (see for example the event cited in lines 683-684). Regarding the toughness experiments, where resistance to mechanical strain was tested in the middle of the leaf length: I have rarely observed leaves being torn at mid-leaf, when still green and healthy. Leaf erosion occurs at dead tips under heavy epiphyte cover leading to a progressive shortening of leavers in the later part of their life span. Leaves that are torn off by water movement generally break at the lunula, the preformed breaking line close to leaf base. I cannot comment on the certainly very professional “Fluorescence, photosynthesis and respiration” part. In summary, this is a valuable methodical paper demonstrating the possibilities of the FOCE system in subtidal plant systems and giving an excellent protocol of how such experiments can and should be conducted. With regard to the results I doubt whether they conclusively demonstrate that ocean acidification has no effect on Posidonia oceanica.

Minor comments: Lines 415-416: What is meant by “amplification of a metabolic sig-

nal”? Line 465: “leaf number” instead of “shoot number” Line 625: I dearly miss a reference to my paper in Marine Ecology 1980 where most of the annual rhythms of leaf appearance, growth and decay, as well as production have been described for the first time. Lines 739-741: There is an error in the citation.

Jörg Ott

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2015-641, 2016.