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Biogeosciences Discussions

Interactive comment on "Effects of drought – altered seasonality and low rainfall – in net ecosystem carbon exchange of three contrasting Mediterranean ecosystems" *by* J. S. Pereira et al.

Anonymous Referee #5

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BGD 2007-0049 Pereira et al., Effects of drought-altered seasonality and low rainfall in net ecosystem carbon exchange of three contrasting Mediterranean ecosystems

The authors describe several years of flux tower data on the carbon balance of a coppiced eucalyptus plantation, an oak savannah, and a grassland on the Iberian Peninsula. The introduction contains a good background on the Mediterranean climate as it pertains to the study sites, and an extensive analysis of the flux data and its relationship to leaf area index, leaf area duration, light use efficiency, and rainfall use efficiency. The main conclusions were that 1) The eucalypts always had greater NEE than the oak or grasslands, 2) drought strongly reduced net ecosystem exchange in all three veg-

etation types, but the eucalypts were likely buffered by their large rooting volume, 3) the eucalypts did not fully recover from drought during the study period, 4) there was marked seasonality in NEE, 5) light use efficiency corresponded with the yearly NEE trends, 6) the eucalypts had higher rainfall use efficiency, and 7) NEE responses to rainfall pulses are driven more immediately by soil C effluxes than by photosynthetic responses.

The manuscript contains some interesting results of interest to the readers of Biogeosciences. I think it can benefit from some further development and refinement at this point.

Introduction: State specific questions or hypotheses in the introduction. This will help guide both the flow of the paper and the reader.

Results 3.1- The seasonal trends in rainfall and how they vary from dry to wet years would be more clear graphically if the graph showed year on the x-axis, the bars clustered by year, and each bar represented a season.

3.2- This section and Figure 2 don't add much to the results, and should be either developed further or omitted.

3.3- The text and abstract report eucalypt NEE of -861 in 2003, but Figure 3 shows 2003 NEE for the eucalypts as only ~ -750? Also, 2005 grassland NEE is +49 in the text but in the graph appears much lower (compare to oak NEE of -85 in the same year) The grass bar should be larger.

3.4- I'd suggest moving the LUE graph (Figure 7) to this section. I didn't understand why LUE was dismissed as a predictor of GPP in this section. Figure 7 shows there likely is a relationship to LUE, which makes sense because LUE should be associated with APAR. This section should be revisited to clarify and simplify the logic.

3.5- The grassland doesn't appear in Figure 5, though the text says it does. Testing the hypothesis that the oaks were transpiring when the grasses weren't is good, but

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if this is an important point in the paper then it should be one of the questions in the introduction.

3.6- The first two paragraphs of this section would fit better in section 3.3 to help explain the interannual pattern.

3.7- Figure 8 contains an interesting result, but is not described adequately in the text. Figure 9 is also an interesting result, but I wasn't convinced from the figure that the oak and grassland RUE increased with drought. Regression statistics are needed for the oak+grassland points, and for the eucalypt points. SEs on the points would also help.

3.8 The single rain event responses are also very interesting, and deserve greater consideration. That respiratory efflux responded much more quickly to precipitation pulses than did photosynthetic uptake is useful information for understanding how increases in extreme precipitation regimes will affect carbon balances.

The key figures were 1,3,6,7 and 9. I think the paper could be much stronger if revised to focus primarily around those figures, guided by a strong set of questions that are framed in the introduction.

General comments: - There was no mention of grazing in the interpretations or discussion of results, yet grazing would have a large influence on fluxes and LAI, LUE, and LAD. I realize grazing was not a 'treatment' in this study, but it is a major difference between the eucalypts and the other two.

- Comprehension would be enhanced if references to year in the text were always to a single year that corresponded to the figures (i.e., 2004, not 2003-2004).

- Pick one label for the sites and stick to it- either call them oak, grassland and eucalypt, or by their local names, but don't switch back and forth.

- With only two years of data, I felt like the inclusion of the grassland site in this manuscript was marginal. No interpretations about 'recovery from drought' should be made for the grassland site, because we can't see what its flux properties were

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previously, as we can for the oak and eucalypt sites.

Interactive comment on Biogeosciences Discuss., 4, 1703, 2007.