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Interactive comment on “Water limitations on forest carbon cycling and conifer traits along a steep climatic gradient in the Cascade Mountains, Oregon” by L. T. Berner and B. E. Law

Anonymous Referee #2

Received and published: 18 October 2015

General comments: The paper describes the influence of water availability on growth and several morphological characteristics of forests, in the Cascade Mountains, Oregon. The impact of changing water availability on forest communities is a highly topical research subject due to the potential for additive climate forcing arising from elevated tree mortality in response to changing hydrological regimes. This paper makes a useful contribution to the subject by conducting a rigorous assessment of some tree morphological and growth traits within and between three species over a severe gradient of water availability and over a period of nearly 50 years.

The paper is nicely written and presents a good standard of research. The conclusions of the study are consistent with existing research but the combination of spatial

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and temporal measures of water availability, together with the good range of tree morphological data and adequate statistical analysis, provide convincing evidence of the linkage of carbon cycling with water availability. The only issue I identified with this ms, like Ref 1, is the lack of acknowledgement regarding the potential weakness of the correlative nature of the study. However, the response of the authors to the criticism made by Ref 1 adequately addresses this criticism. Otherwise, a very interesting and well written study; only a few minor points outlined below.

Specific comments: I would suggest altering the paragraph starting on P. 14510, line 20, in which ' $\Delta\Psi$ ' is used to describe $\Psi_{\text{xylem/plant}}$. It is not change in Ψ that causes hydraulic failure, but absolute Ψ . Therefore, lines 3, 8 and 10 on P. 14511 are not technically accurate. On the other hand, it is correctly referred to as $\Delta\Psi$ in lines 13 P. 14511, and line 13 P. 14531: the total difference in Ψ between soil and roots (which leads to lower absolute Ψ in the canopy, for a given Ψ_{soil}).

Technical corrections: 1. Legend of Table 1: 'Climate variable(s)'

2. Legend of Table S6, line 68: 'the(n)...'

3. P. 14514, line 3. GTOS protocol should be referenced

4. P. 14522, line 19. 'considerably'

5. P. 14522, line 19. Referred to '(Fig. 2d-f)' but the individual panels are not labelled in the actual figure.

6. P. 14524, line 25. 'photosynthesis - respiration'

7. P. 14526, line 25. 'variance'

8. P. 14530, line 20. 'increases' in P50

9. P. 14531, line 27, 29. 'tension' does not describe leaf water potential, which includes hydrostatic pressure, osmotic potential and matric potential and, therefore, these lines should be changed to 'potential'.

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