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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

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Referee 3 (Adam Collins)

Referee 3- General comments:

The authors present an extensive observational study about how moisture conditions impact a variety of growth responses and traits in three tree species in Oregon, USA. The main independent variable is the 'climate moisture index', which effectively explains a large degree of inter-species variability in carbon responses, demonstrating that species occupying drier sites are more coupled to inter-annual moisture variation than species at wetter sites. This result contrasts with the observed decline in growth

of trees at the wettest sites, which during a period of sustained lower moisture experienced a sharp decline in growth. Analyses of correlations between morphological traits and climate moisture suggest that trees trade hydraulic resilience with competition for carbon. The results imply that future moisture regimes along with changes in abiotic and biotic stresses could significantly alter growth, survival, distribution and thus biogeochemical processes.

The study was well executed and clearly presented. The conclusions are logical and sources of error or alternative explanations adequately discussed. That the findings aren't terribly surprising and in fact confirm much previous research doesn't detract from the importance of such a nicely done correlative study such as this. This paper presents an important addition to the body of literature regarding regional climate effects on forest processes and highlights the need for further investigation of these processes with additional parameters and better model parameterization.

Response to general comments:

We thank Mr. Collins for taking the time to review our manuscript, noting several of its merits, and providing technical comments. We've addressed the technical comments in the revised manuscript.

Referee 3- Technical comments:

Pp. 14510, Line 5: 'form' should be 'forms'

Response: Fixed

Pp. 14513, Line19: 'We calculated SLA' erroneously inserted into 'US-Me6'

Response: Fixed

Pp. 14519, Line 4: Why not present r-square here also, as later used?

Response: These have been changed from r to r2 values to maintain consistency in the manuscript.

Pp. 14519, Line 5: What about agreement with US-Me6 site?

Response: We compared PRISM-derived estimates of PPT and ET0 against the US-Me6 flux tower measurements and added the following text:

“Modeled monthly ET0 and PPT agreed relatively well with meteorological measurements at the US-Me2 flux tower site from 2002 to 2012 (r2=0.57-0.64, P<0.01) and at the US-Me6 flux tower from 2010 to 2013 (r2=0.58-0.65, P<0.01).”

Pp. 14519, Lines 15 -19: The ‘stats’ package in R is part of the base distribution, thus doesn’t necessarily warrant specific mention here. However, calculation of r-square of nonlinear models is not standardized, so please be explicit as to how it was calculated.

Response: Reference to the ‘stats’ package has been removed. We added an explanation for the computation of the coefficient of determination (r2):

“For each model we calculated the root mean squared error (RMSE) and the coefficient of determination (r2), which was computed based on the proportion of the total sum of squares explained by the model.”

Pp. 14521, Line15-16: Figures not labeled ‘a’ through ‘c’, please correct in text or figure.

Response: The labels disappeared during typesetting; we will resolve this issue.

Pp. 14522, Line19: Figures not labeled ‘d’ through ‘f’, please correct in text or figure.

Response: The labels disappeared during typesetting; we will resolve this issue.

Pp. 14523, Line 8: This is the only mention of a Kruskal-Wallis test, please explain in the methods first.

Response: We added the following text in the Methods section:

“We also tested whether the percent of trees at each site that exhibited a significant RWI-CMI correlation (FRWI-CMI) differed among the three forest types using a non-

parametric Kruskal-Wallis rank sum test (Kruskal and Wallis, 1952), which assess the null hypothesis that all samples come from the same distribution.”

Interactive comment on Biogeosciences Discuss., 12, 14507, 2015.