

## ***Interactive comment on “The root economics spectrum: divergence of absorptive root strategies with root diameter” by D. Kong et al.***

### **Anonymous Referee #2**

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#### General comments

This is an interesting study on the relationships between root diameter and root strategies for resource acquisition. This study is based on seven contrasting tree species from tropical and subtropical forest, and a range of root traits to test (1) the influence of root diameter on the root economic spectrum and (2) the influence of root branch order on root C and N fractions. The gradient of plant trait variation, called economic spectrum, has been found world-wide describing the existence of a fundamental trade-off between acquisition and conservation of resources in plant species. However, our knowledge of below-ground trait variation and their economics remains limited and inconsistent (Chen et al., 2013; Bardgett et al., 2014; Poorter et al., 2014; Reich, 2014). Consequently, the aim of this study is very relevant. But the authors only used 7 seven

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three species from tropical and subtropical forests, which is inadequate and quite ambitious to extend this study to the root economic spectrum as indicated in the title. The choice of plant species and root traits are justified but this study will gain in interest with more vegetation types to test the root economic spectrum as announced by the title. More chemical traits implied in root absorption would have been appreciated to test the hypothesis and to gain more insight of root absorption strategies for nutrient capture as expected. The authors wanted to demonstrate the importance of the cortex and epidermis thickness in the root absorption strategy, which seem to be an important root trait for future research in root ecophysiology. Although this study is interesting, it does not correspond to the title. This manuscript is well written but some more proofreading would have been appreciated to avoid few mistakes. Consequently, some parts should be rewrite and correct to improve the quality of the manuscript.

#### Specific comments

Page 13043, line 6 : It would have been appreciated to read more details on the studied vegetation in the abstract. Could the authors specify which kind of plant species are considered in this study and where they come from ?

Introduction is clear but few references are missing in the 'Reference' section, while more references would have been appreciated to justify the choice of root traits.

Material and Methods are too concise and sometimes informal. Some parts of the 'Material and Methods' section should be rewrite to improve the clarity of the work realized. Methods use to separate thin and thick roots should be better explained and easy to reproduce to gain in interest and to ensure the repeatability of this work among studies. In addition, some important details are missing to gain in clarity on the representativeness of the root subsamples used for root trait measurements. In addition, I suggest to use the passive form and remove few parts of the 'Statistical analysis' paragraph to the Results section to improve the quality of the text.

Page 13046, line 22: Could the author specify the root mass or fraction of subsample

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collected to gain more insight of the subsample representativeness.

Page 13047, line 8: It is very surprising to measure the root length with a tape whereas high efficient image software would have been more precise to analyse the root length and the root diameter. Could the authors justify this choice ?

Page 13047, line 24 : This work is very long and impressive, I suggest to insert root slices pictures of the seven species in Supplement.

Page 13048, line 1 : As the study deals on root order and thin vs. thick roots, it would have been appreciated to briefly describe the determination of absorptive roots.

Page 13048, lines 4 - 21 : Only two fractions are defined in the Introduction (labile vs. recalcitrant frations). Could the author unify the terms used in the introduction with the following parts to gain in clarity ?

Page 13048, lines 10 - 13 : Parenthesis are missing.

Page 13048, line 17 : Please, could the authors correct the sentence.

Page 13048, line 25 and Page 13049, line 21 : It is also very surprising to introduce a new root trait and new set of plant species at the end of this Material & Method section. It would have been appreciated to present the additional plant species in the 'Plant species and sampling site' section.

Page 13049, lines 9 and 23 : The cutting point between the thick and thin absorptive roots should be introduced earlier in the text. This study will gain in clarity by better explain how thin and thick absorptive root are determined, and by using a common cutting point between the studied plant species and the additional set of 96 plant species. Could the authors explain why the cutting point was not similar between the two set of plant species ?

Results section are too concise and would have been easier to understand by presenting first the effects of plant species on the measured root traits before presenting

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the root strategies and root trait relationships. In addition, it would have been appreciated to see the regression lines on the Figures presenting root traits relationships, and a multivariate analysis to better synthesize the results and to clearly understand the trade-offs between root strategies presented in this study.

Page 13050, lines 14 and 19 : What does 'medium', 'higher' and 'lower' mean ? Please, could the authors specify the thresholds used ?

Supplement, line 20 : It is very surprising to modify the dataset. Please, could the author explain why they removed some points to arrange the results ?

Discussion : Conclusions of this study seem to be highly influenced by the methods used to separate thin and thick roots, and the definition of C and N fractions as well, which imply to better define these traits in the 'Introduction' and 'Material and Methods' sections.

Page 13050, lines 20 - 27 : Discussion of the root traits relationships should be better supported by showing the regression lines, which are not obvious to see on the presented figures.

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