

## ***Interactive comment on “Soil properties determine the elevational patterns of base cations and micronutrients in plant-soil system up to the upper limits of trees and shrubs” by Ruzhen Wang et al.***

### **Anonymous Referee #2**

Received and published: 21 October 2017

General comments: This paper addresses how base cation and micronutrients vary with elevation, specifically in relation to soils under trees and shrubs and in tissues of target trees and shrubs along each gradient. It contributes valuable information on the influence of elevation on base cations as well as micronutrients, and reports results from three elevational gradients representing different environmental conditions.

My main concern is the lack of information from the study systems and sampling design which currently limits the ability to fully interpret the results. Information of the elevations studied at each location - which should automatically provide elevational ranges studied - is needed to provide information on, and assess, the comparability among

C1

sites studied.

Other relevant information to include would have been MAT and MAP along the studied elevational ranges at each gradient. Water movement is important for the movement and concentrations of soil base cations and nutrients, and is influenced by slope and inclination (local topography at each elevation). So if available, this information would be valuable to include. Another factor that can influence soil properties and processes is the underlying bedrock, and it should be particularly relevant here.

The approach used - sampling soil and plant tissues from/under trees and shrubs – can be valuable to address how plant-soil linkages changes along environmental gradients. The species elevational range is provided in the methods, but it is not clear which part of their range was sampled or why these specific plant species were targeted for this study. For instance, are they species that are well adapted to certain environmental conditions represented by each location? And/or are they the commonest species of these growth forms at each location? This kind of information is relevant in describing the context of the study and study systems.

Additionally, the species chosen are functionally rather different which consequently could influence soil properties in different ways. While this is not explicitly addressed, given that SOC and pH are important drivers for many patterns, the identity of the species may be an important factor influencing the results (which the authors also briefly mention in the discussion on lines 350-352). Although site is a random factor in the analysis of across site effects, I wonder if treating them as main factors (trees versus shrubs) without accounting for the differences among species within these growth forms may mask some important information that seems central to the study question of plant-soil linkages and how they may change with elevation.

Specific comments:

Line 117-123: Is the MAP values reported relevant for the study locations/gradients? Does MAP change with elevation along the range studied at the three gradients, or

C2

only from the Changai mountain?

Lines 125-130: Why were these specific plant species studied?

Lines 135-140: More information on sample handling prior to analysis would be valuable here. Were the samples for each species/below each species bulked?

Lines 143-154: Was all soil dried? A number of these analyses should be done on wet soils (e.g. lines 150-153).

Lines 170-185: The abstract and results mentions results from a multiple regression but this analysis is not mentioned in the methods section.

Lines: 185-190: Soil pH under tree canopies decreased with elevation, but increased with elevation under some shrubs. Are there any understory species growing under trees, or was the ground more or less open, or covered with litter from the target tree only? Sampling soil specifically under a tree and specifically under a shrub may be very different in terms of targeting the influence of the actual species on soils.

Lines 279-295: Or could it indicate species specific responses and effects on soil properties?

Lines 337-341, 350-352: It seems plausible that the concentrations of nutrients in the soil are important to determine plant tissue nutrient concentrations and also vice versa, but it is not clear how the final conclusion (referring to Hobbie 1992, lines 350-352) can be drawn from the data or the discussion in this same paragraph. However, because of the functionally different species sampled at each site it would have been interesting and important to consider here.

The findings by Campo-Alves (2003) should be relevant to discuss in relation to this study. Campo-Alves J. 2003. Nutrient availability and fluxes along a toposequence with tropical dry forest in Mexico. *Agrociencia* 37:211–19.

Technical corrections:

C3

Line 70. There is a word missing to connect the first part with the second part of the sentence.

Line 365: Word missing: "one of (the) main. . ."

---

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2017-298>, 2017.

C4