

# ***Interactive comment on “Soil CO<sub>2</sub> efflux in an old-growth southern conifer forests (*Agathis australis*) — magnitude, components, and controls” by L. Schwendenmann and C. Macinnis-Ng***

## **Anonymous Referee #3**

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This study reports measurements of soil respiration and their component parts in a kauri forest in New Zealand. Both trenching and statistical techniques are used to partition the total soil efflux into auto and heterotrophic respiration. Statistical methods are then used to investigate the temporal controls by environmental parameters. Tree root biomass and “tree influence” are used to look for controls on the spatial variability in soil CO<sub>2</sub> efflux. There are extensive references and good comparisons with data from the NH. The interest in this manuscript doesn't so much lie in its respiration results and partitioning, but rather its combination of soil respiration and spatial patterns relating to root biomass.

An attempt was made to test soil respiration methodology with comparisons between surface and inserted rings. However, this was not well described in the introduction and I was confused to why they did this. In the Experimental Setup the reason for the inserted and surface chambers should be explained. I found the overall aims of the manuscript confusing and this wasn't helped by the description of the methods and the 5 different types of soil surface measurements. A better way to arrange this might be to describe each aim and then the methods that go with it. Eg Collar insertion depth, respiration partition, annual soil respiration, spatial variability vs temporal variability. It would be good to see the data, especially the relationship between soil respiration (total, Ra, Rh) and temperature.

The comparison of average soil respiration with other sites does not take temperature into account. It would be better to compare R10 or Q10 values. Alternatively you could use your know relation with temperature to adjust your values to the same temperature at other sites. The collars were inserted in November 2011 and efflux measurements commenced in January 2012. This does not leave enough time for the roots to decompose; therefore this is not truly a measurement of heterotrophic respiration. How was this accounted for and was there a decrease in RH over time as the roots decayed? In the study site description, it would be good to know that the forest had been disturbed by tree removal and may not be in equilibrium. L 187 states that efflux was measured on a number of days immediately after trenching, but this data are not presented. L 203 Where was this temperature measured, in the chamber? L 221 delete "of", also (45% C, 25 2.3% N) doesn't make sense. L 236 You state that there are two replicates, but on L 182 it says "one location" L 255 spelling of "Surfave" L 263 Table 3 is referenced before Table 2 L 294 Please state which subplot is being refereed to (Fig 2.?), also what is 14.2 +/- 0.1 a SD of a SEM L 294 Please refer to the months as well as the season L 300 Fig 2A L 303 Change "locations" to times. L 313 I couldn't see an increase in variability during the dry summer of 2013 (I gather this is Jan – Mar 2013?) L 317 The data for summer/early autumn 2012 is not presented. L 329 Was SWC really affected by collar insertion, if so how? L 367 I am not sure how we can see in the table

that there is a sign changes around 40% soil water content. L 377 Change Table 1 to Table 2 L 381 Table 1 does not show the 0-30 cm values L 399 3.47 umols is 3.6 umol on line 303 L 458 Fig 2 the temperature difference is > 5 degrees” but Table 2 shows 6.6 degrees). Maybe there is a temperature response but it doesn’t show up with such a small temperature range. L 466 This sentence doesn’t make sense. L 482 Are the mature kauri at the site emergent? If so then state this in the site description. L 516 State early on that you are going to test the effect of collar depth on effluxes.

Table 1 It would be good to have the litterfall summed over a year so it can be compared with other sites. Table 2 I don’t think it is necessary to show both the STD and the SE. Outside is misspelt as “Outsite\_Trench\_Surface”. Using x, y and z for significant differences is confusing, stick with “c, d, e”. Table 3. Why are some numbers italicized? You need to define what a, b and c are.

Fig 1 “Unknown”? – seems like it should be possible to get an identification of the tree species over the two years of the study, surely it can be classified as a broadleaf or not. The unknowns are filled circles, but open circles in the legend. There are two types of stars. How much are the size of the circles are scaled by the diameter? The 0.5 m contour lines are not really needed unless referred to in the manuscript. The plot has “trenched plots” as a title, this should be removed. Fig 2. These plots need to be labelled a, b, c. The sample points are joined up with lines; I cannot see why this can’t be done in the SWC graph. The figure caption should indicate that these are means and state which soil efflux is being referred to (surface, trenched, inserted, plot or outside). Fig 4. Subplots should be labelled a-f. On subplot 4.2b the equation is wrong and ends up outside the 2nd x axis. L 984 is missing a “)”, S is given in cm<sup>2</sup> but the units along the x axis are in m<sup>2</sup>. Is m<sup>-2</sup> m<sup>-2</sup> correct? A is described as coefficient form, but does not appear in the equation.

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Discussion paper

