Influence of different tree species on autotrophic and heterotrophic soil respiration in a mined area under reclamation

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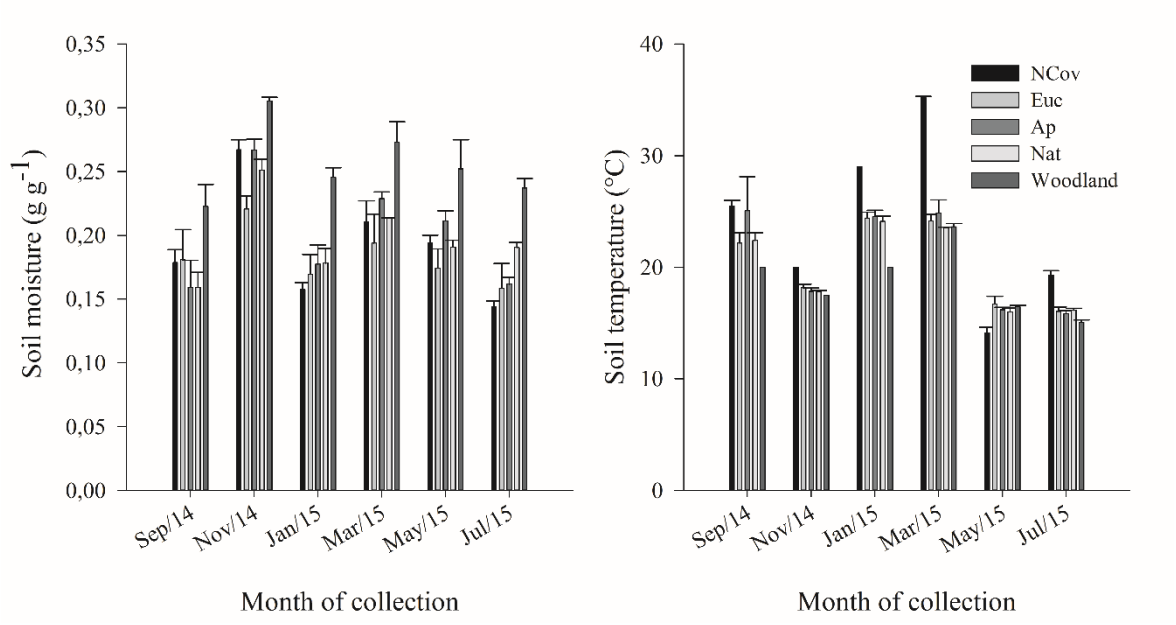

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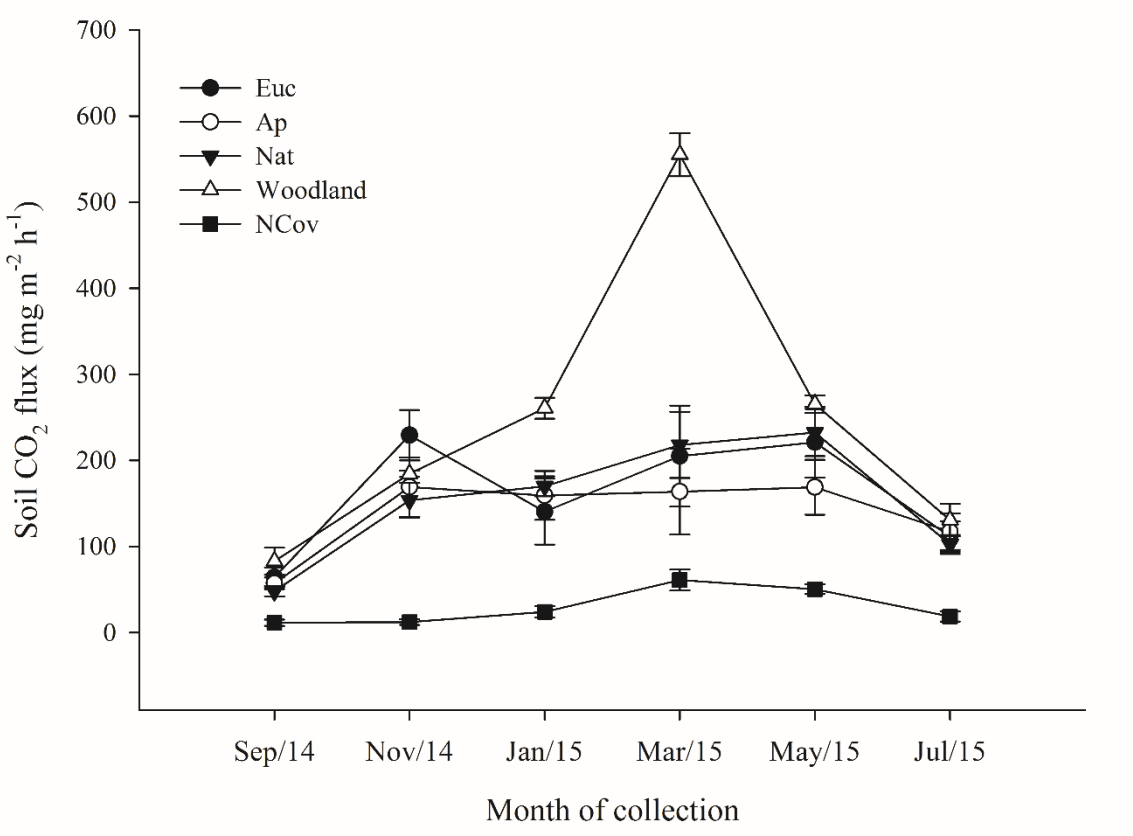
29 **Figure 1.** Soil moisture (a) and temperature (b) in a bauxite mining area in recovery with
30 eucalyptus (Euc), *A. peregrina* (Ap) and a mixed plantation of native species (Nat), native
31 forest in the second stage of regeneration (Woodland), and an area with no ground cover
32 (NCov). (Bars indicate the standard error around the mean).

a)

b)



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Situation	Relative proportions (%) of CO_2 efflux					
	Month of collection					
	Sep/14	Nov/14	Jan/15	Mar/15	May/15	Jul/15
Euc	76,08 Ab	125,98 Aa	49,16 Ac	29,51 Ac	79,93 ABb	82,73 Ab
Ap	64,12 ABbc	91,07 ABa	57,13 Ac	21,22 Ad	56,45 Bc	87,98 Aab
Nat	51,34 Bbc	91,07 ABa	61,59 Aab	32,13 Ac	85,02 Aa	74,78 Aab

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36 **Figure 2.** (a) Soil CO_2 efflux in an area of bauxite mining in process of recovery with
37 eucalyptus (Euc), *A. peregrina* (Ap) and a mixed plantation of native species (Nat), forest
38 in secondary stage regeneration (Woodland), and an area with no ground cover (NCov)
39 during the six months of collection. (Bars indicate the standard error around the mean, n =
40 6). (b) Relative proportions (%) of CO_2 efflux = (CO_2 efflux with forest cover - CO_2 efflux
41 NCov)/(CO_2 efflux Woodland - CO_2 efflux NCov)*100.

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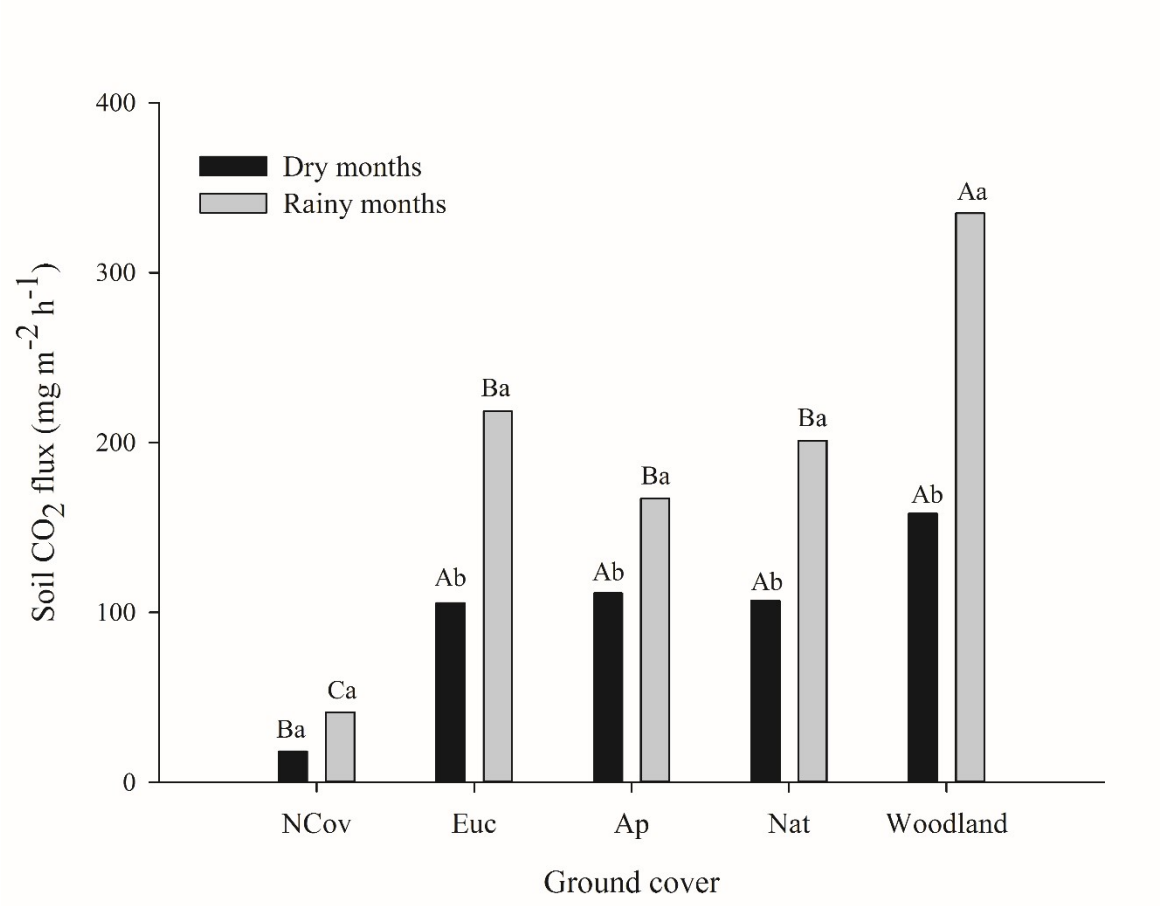


Figure 3. Soil CO_2 efflux in an area of bauxite mining in recovery with eucalyptus (Euc), *A. peregrina* (Ap) and a mixed plantation of native species (Nat), forest in secondary stage regeneration (Woodland), and an area with no ground cover (NCov) during the wet and dry months. Uppercase letters compare between soil CO_2 efflux for the different types of forest cover for each month, while lowercase letters compare each type of cover between the dry and rainy months, and when similar, indicate the lack of significant difference between them by Tukey's test at 10% probability.

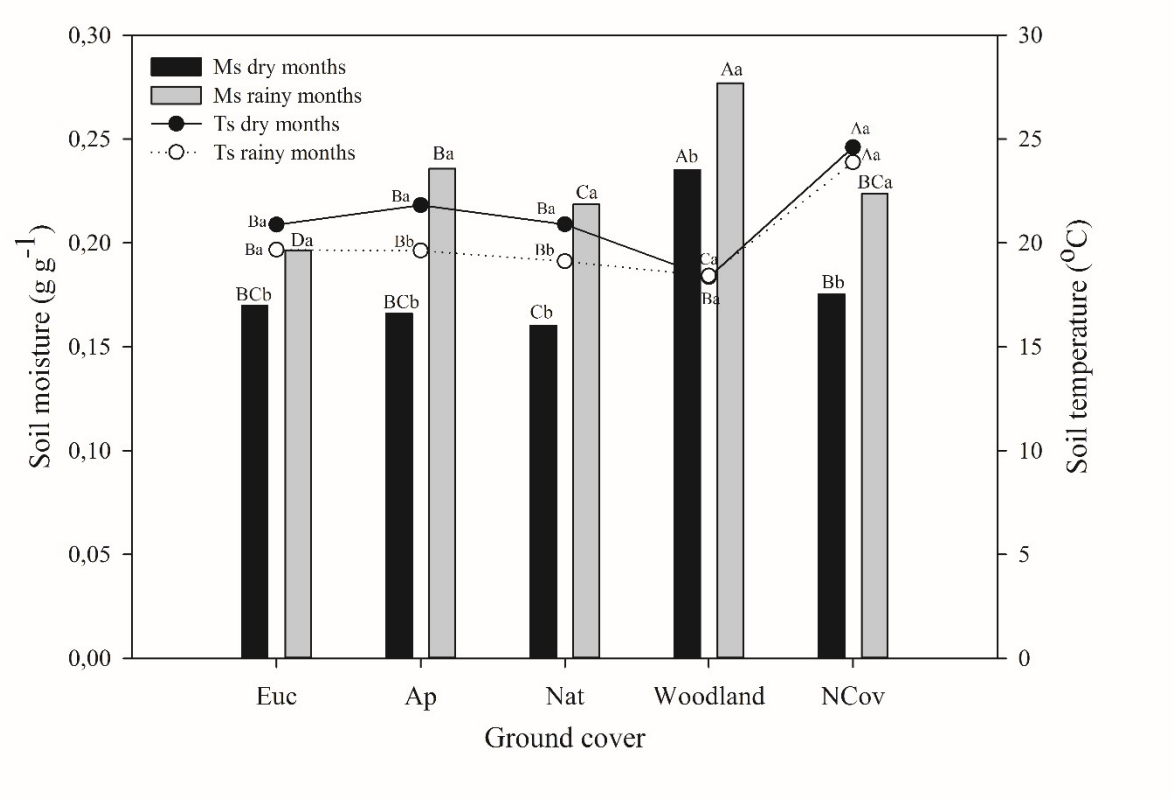


Figure 4. Variation in the average soil moisture (Ms) and soil temperature (Ts) in the dry and rainy months, during the evaluation of soil CO_2 efflux in an area of bauxite mining in recovery with eucalyptus (Euc), *A. peregrina* (Ap) and a mixed plantation of native species (Nat), forest in secondary stage regeneration (Woodland), and an area with no ground cover (NCov). Uppercase letters above the columns or above the lines compare soil moisture or soil temperature respectively for the different forest covers for each month, while lowercase letters compare each cover between the dry and rainy months, and when similar, indicate the absence of significant difference between them by Tukey's test (10%).

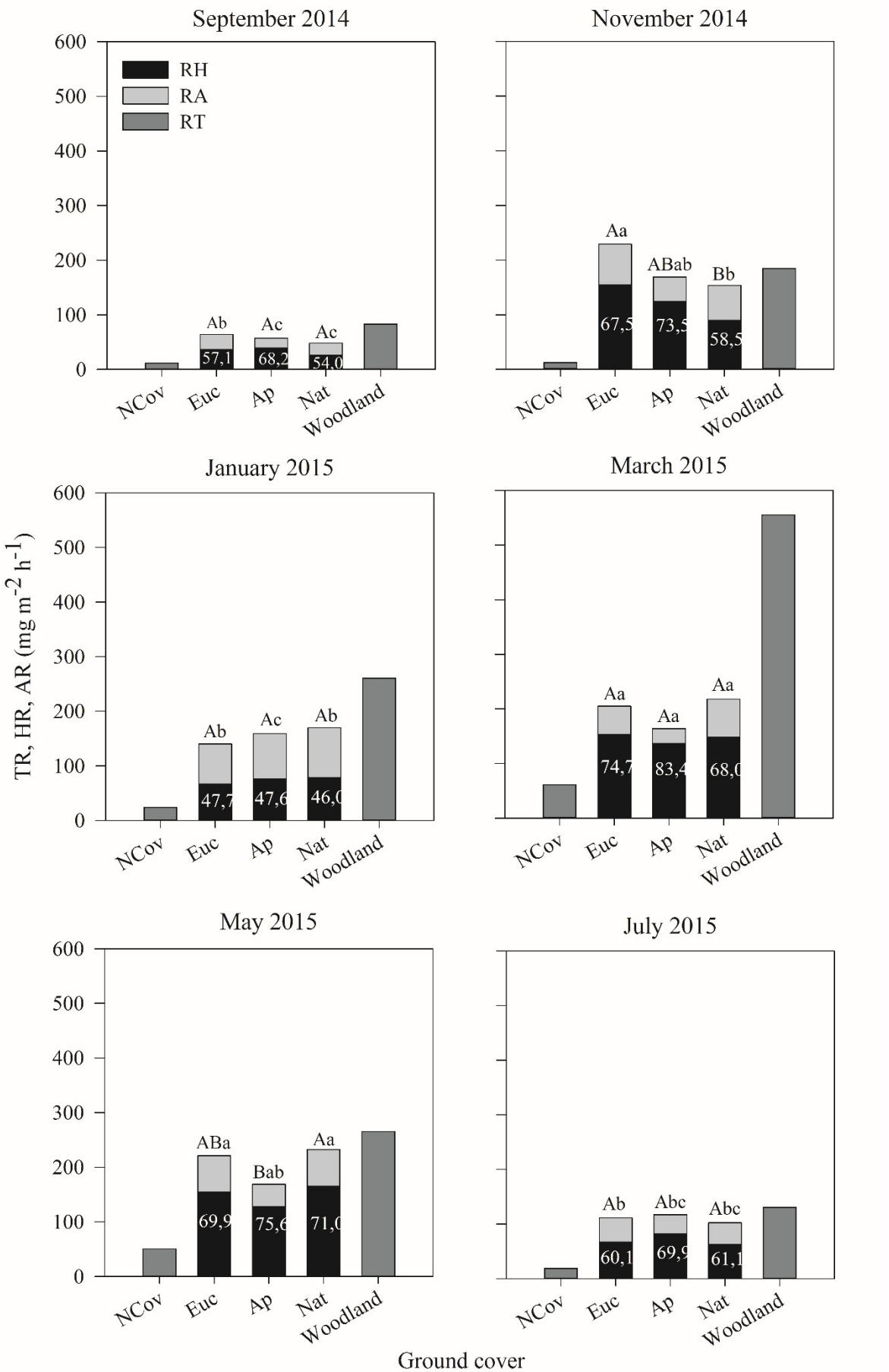

September 2014
November 2014
January 2015
March 2015
May 2015
July 2015
RH
RA
RT
TR, HR, AR (mg m-2 h-1)
Ground cover
NCov
Euc
Ap
Nat
Woodland
Ab
Ac
Aa
ABab
Bb
ABa
Bab
Abc
57,1
68,2
54,0
67,5
73,5
58,5
47,7
47,6
46,0
74,7
83,4
68,0
69,9
75,6
71,0
60,1
69,9
61,1

Figure 5. Total (TR), autotrophic (RA) and heterotrophic (RH) soil respiration in an area of bauxite mining in recovery with eucalyptus (Euc), *A. peregrina* (Ap) and a mixed plantation of native species (Nat), forest in secondary stage regeneration (Woodland), and an area with no ground cover (NCov) for the six evaluations. Values within the columns represent percentage HR in relation to TR. Uppercase letters compare between the HR of the different types of forest cover for each month, while lowercase letters compare each type of cover over the months, and when similar, indicate the lack of significant difference between them by Tukey's test (10%).

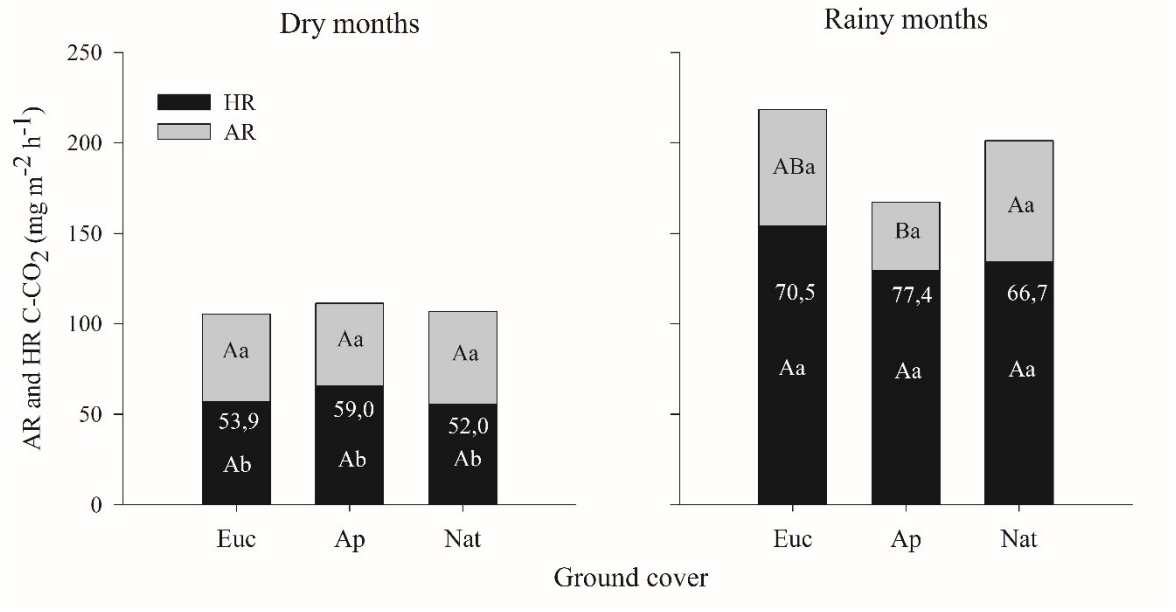


Figure 6. Partitioning of total soil respiration (TR) into autotrophic (AR) and heterotrophic (HR) respiration in an area of bauxite mining in recovery with eucalyptus (Euc), *A. peregrina* (Ap) and a mixed plantation of native species (Nat), during the dry and rainy months. Capital letters compare HR and AR in the different types of forest cover for each month, while the lowercase letters compare each type of cover between the dry and rainy months, and when similar, indicate the lack of significant difference between them by Tukey's test (10%).

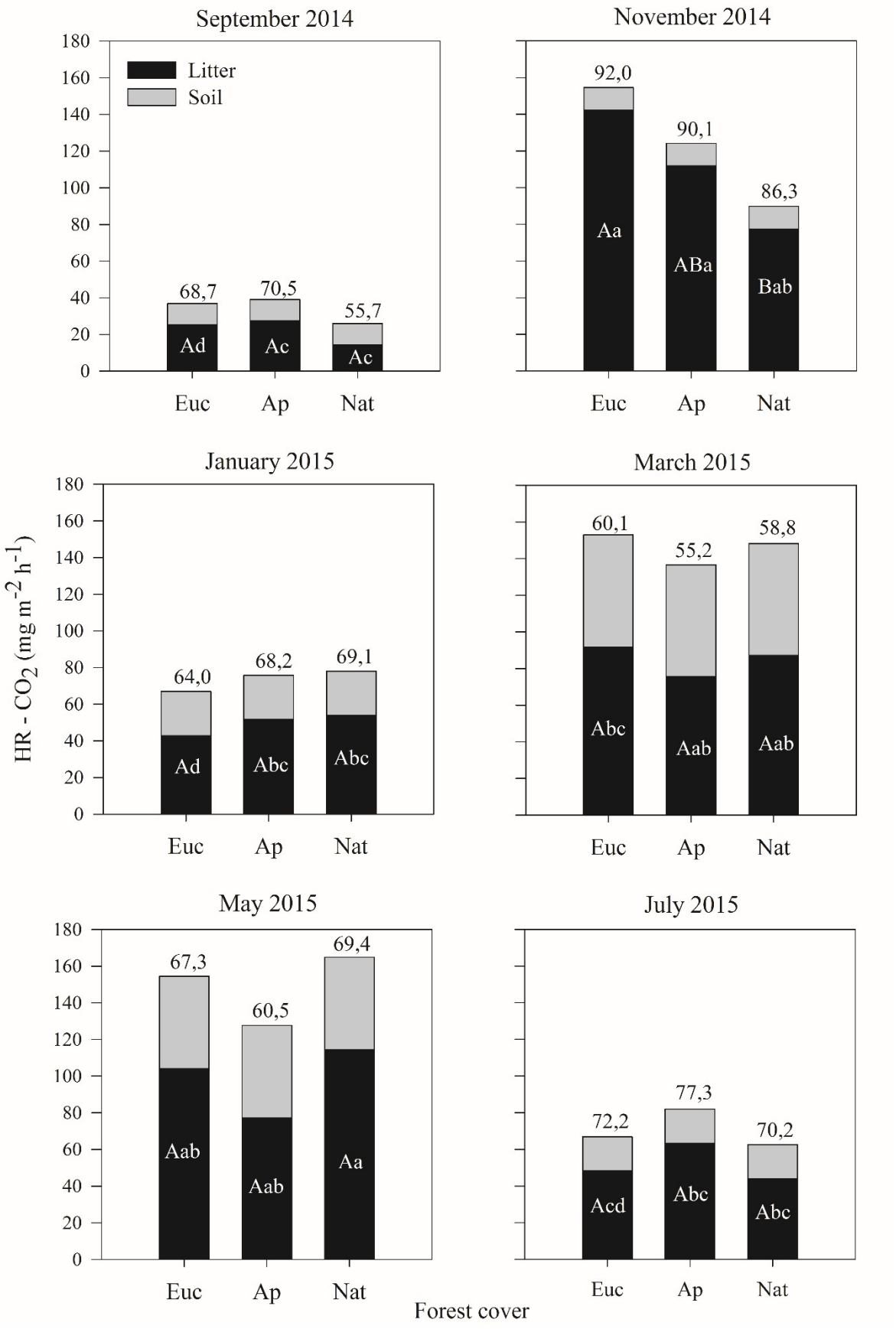
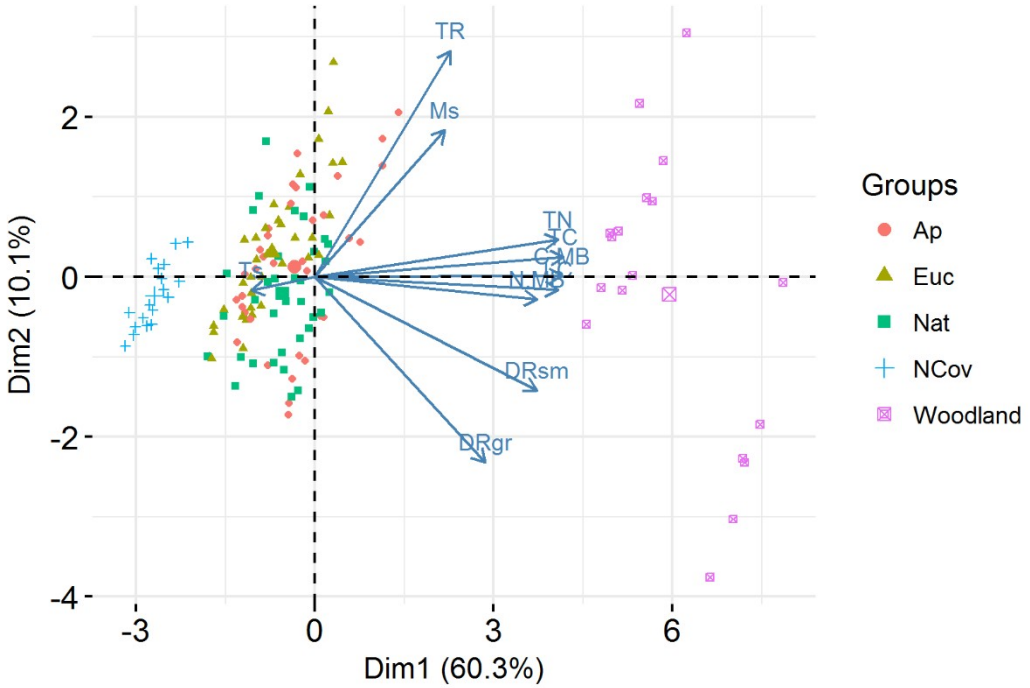

September 2014
November 2014
January 2015
March 2015
May 2015
July 2015
Litter
Soil
HR - CO_2 (mg m^{-2} h^{-1})
Forest cover
Euc
Ap
Nat
68,7
70,5
55,7
Ad
Ac
Ac
92,0
90,1
86,3
Aa
ABa
Bab
64,0
68,2
69,1
Ad
Abc
Abc
60,1
55,2
58,8
Abc
Aab
Aab
67,3
60,5
69,4
Aab
Aab
Aa
72,2
77,3
70,2
Acd
Abc
Abc

Figure 7. The contribution of litter and soil (soil organic matter) to heterotrophic soil respiration in an area of bauxite mining in recovery with eucalyptus (Euc), *A. peregrina* (Ap) and a mixed plantation of native species (Nat), during the six months of collection. Mean values above the bars represent the percentage of litter contribution to soil HR. Uppercase letters compare the contribution of litter between the different types of forest cover during each month, while lowercase letters compare each type of cover over the months, and when similar, indicate the lack of significant differences between them by Tukey's test (10%).



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110 **Figure 8** Dispersion of the properties of the soil and of the areas of eucalyptus (Euc), *A.*
111 *peregrina* (Ap) and the mixed planting of native species (Nat) in an area of bauxite mining
112 in recovery, forest in secondary stage regeneration (Woodland) and an area with no ground
113 cover (NCov) into principal components 1 and 2 (Dim1 and Dim2). TR = total soil
114 respiration; Ms = soil moisture; Ts = soil temperature; DRsm and DRgr = root density
115 smaller and greater than 2 mm in the 0-20 layer respectively; TC, TN and LC = total
116 organic C, total N, and labile C in the 0-10 cm layer respectively; CMB and NMB =
117 microbial biomass C and N respectively.