

Interactive  
Comment

# ***Interactive comment on “Weathering by tree root-associating fungi diminishes under simulated Cenozoic atmospheric CO<sub>2</sub> decline” by J. Quirk et al.***

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Quirk and colleagues present here experimental and modeling results that quantify the effect of atmospheric CO<sub>2</sub> on plant- and mycorrhizal-mediated chemical weathering. This topic is of broad significance to biogeochemistry, and especially the long-term dynamics of carbon and nutrient cycling. The presented results break substantial new ground, particularly with regards to quantifying the role of CO<sub>2</sub> and mycorrhizae on chemical weathering. This paper should serve as an important reference for years to come.

The authors note in their introduction that long-term carbon cycle models like

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GEOCARB include in their parameterization a CO<sub>2</sub> fertilization effect on chemical weathering. The authors now have, for the first time, a quantification of this effect. Given this, it would be useful to cross-check with the (previously untested) parameterization of GEOCARB. In GEOCARB:  $f_{BB} = (1 + 0.087 \cdot GCM \cdot \log(RCO_2) - 0.087 \cdot W_s \cdot (t/570) + 0.087 \cdot GEOG) \cdot (2 \cdot RCO_2 / (1 + RCO_2))^{FERT}$  where:  $f_{BB}$  is the effect of CO<sub>2</sub> on plant-assisted weathering for silicates and carbonates at time (t) to the present-day; GCM is related to climate sensitivity ( $\Delta T_{2X}$ ), where  $\Delta T_{2X} = GCM \cdot \ln(2)$ ; t is time in Myrs ago; GEOG is the change in land mean surface temperature at time (t) relative to the present-day due only to changes in paleogeography (K); and FERT is the fraction of vegetation whose growth is stimulated by elevated CO<sub>2</sub>; it is related to enhanced chemical weathering by the Michaelis-Menton expression  $[2RCO_2 / (1 + RCO_2)]^{FERT}$ .

Holding all parameters other than CO<sub>2</sub> constant, and assuming the standard value of 0.4 for FERT, how close does the GEOCARB response (i.e.,  $[2RCO_2 / (1 + RCO_2)]^{0.4}$ ) match the measured response by the authors?

Two minor comments:

It would be helpful to cite this paper in the introduction: Andrews, J., and Schlesinger, W., 2001, Soil CO<sub>2</sub> dynamics, acidification, and chemical weathering in a temperate forest with experimental CO<sub>2</sub> enrichment: Global Biogeochemical Cycles, v. 15, p. 149-162.

On p.3 , line 17: need a reference for this statement.

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Interactive comment on Biogeosciences Discuss., 10, 15779, 2013.

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