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Interactive comment on "Application of relaxed eddy accumulation (REA) on managed grassland" *by* M. Riederer et al.

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I have two short comments:

1) The basis for Equations 8 and 9, pertaining to the partitioning, is unclear. The equation relating Delta_e to delta_A, which was given in Farquhar et al 1989, is: Delta_e = (delta_source - delta_product)/(1 + delta_product) = (delta_air - delta_A)/(1 + delta_A). Thus in Equation 8, the authors appear to make the assumption that the composition of the updrafts is equivalent to the composition of the canopy air, and that the denominator (1 + delta_A) can be ignored. The latter assumption, though common, leads to an error in Delta_e of about 0.7 permil. Equation 9 describes Delta_e purely in terms of the isotopic compositions of the up- and downdrafts, which ought to be affected

not only by Delta_e but also by the degree of turbulent mixing, the rate of photosynthetic assimilation, and the rate and isotopic composition of ecosystem respiration. For example, if the turbulent mixing were to become much more efficient while Delta_e and all other parameters were constant, it seems that Equation 9 would show Delta_e decreasing. Similarly, it seems that a change in the rate or isotopic composition of ecosystem respiration would induce a change in Delta_e as calculated by Equation 9.

2) Through the first sentence of the abstract and the final sentence of the first paragraph of the introduction, the authors imply that there are no sensors fast enough for eddy covariance of 13CO2, but three studies have reported direct eddy covariance measurements of the 13CO2 isoflux using laser spectroscopy (Griffis et al 2008 JGeoRes, Sturm et al 2012 AgForMet, Wehr et al 2013 AgForMet). REA can still be a useful approach for measuring isofluxes, but the authors might consider placing it in the context of the full array of approaches that are available: the flux-gradient method (Flanagan et al., 1996), modeling (Ogée et al., 2003; Lloyd et al., 1996), hyperbolic relaxed eddy accumulation (HREA, Bowling et al., 2001; Bowling et al., 2003a; Wichura, 2009; Wichura et al., 2004), the hybrid eddy covariance/flask gradient method (Griffis et al., 2004; Bowling et al., 2003b), and direct isotopic eddy covariance (Griffis et al 2008, Sturm et al 2012, Wehr et al 2013). The EC/flask method was first proposed by Bowling et al 1999 (GBC, vol 13 no 4 pp 903-922), which might be a good reference to use in place of Bowling et al 2003b.

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