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Atmospheric Measurement Techniques Discussions

Interactive comment on "Ecosystem fluxes of hydrogen: a comparison of flux-gradient methods" *by* L. K. Meredith et al.

Anonymous Referee #2

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The manuscript in question is an extremely thorough comparison/evaluation of several methods for quantifying soil uptake of H2. The work takes advantage of a new analytical method that is precise enough to observe gradients of H2 with better than 1 ppb precision allowing for measurement of above canopy gradients over a modest 4 meter change in elevation. The work is thorough, maybe overly so (i.e. some material might be better suited for a supplementary section), and is certainly worthy of publication. My temptation is to recommend publication in its current form but I have a few thoughts that the authors might want to take into consideration. The forced distinction between above canopy and below canopy leads to awkward sentence fragments such as "..the presence of an additional H2 source above the 2 m below canopy flux measurement,...". Why not state initially that the 2 m below canopy results will be

referred to as 2 m and dispense with the "below canopy" qualifier? There is no above canopy 2 m measurement so the distinction is redundant. Obviously, there are certain aspects to the discussion where the distinction between above and below canopy is relevant, e.g. when discussing the difference in footprint, etc. but otherwise the qualifier is unnecessary. Not that it necessarily needs to be addressed in the paper but in the discussion of bias the authors note correctly that use of a single instrument helps to reduce bias. This is true although two instruments being used in an alternating sequence would also reduce bias and double the sampling frequency which would help to reduce the effects of temporal variability in fluxes or meteorological forcings.

There is at least one other experiment in the literature that utilized comparison of nocturnal H2 and CO2 gradients to estimate H2 flux, i.e. Rahn, et al., GRL, 2002. If for no other reason the reference serves to show how far the current work advances the methods of only a decade or so ago.

It might be easier for the reader if sections 4.2 and 4.3 were further sub-sectioned e.g. trace gas similarity, sensible heat similarity and K parameterization.

Finally, the prevailing mechanism proposed for H2 ecosystem loss is via uptake in soils. Although the uncertainties for results presented in figures 10 and 11 preclude the conclusion that definitive differences are observed at different levels below, within and above canopy, the results shown yield tantalizing evidence that there may be more to the ecosystem H2 budget than simple soil uptake.

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