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Comment

Interactive comment on “Technical Note: Hyperspectral lidar time series of pine canopy physiological parameters” by T. Hakala et al.

M. Disney (Referee)

mathias.disney@ucl.ac.uk

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I think this paper in general presents interesting results from a new hyperspectral lidar instrument. This kind of measurement is likely to hold real promise for disentangling structure and spectral properties of vegetation canopies. The work is generally clear and well-written. I have a few comments on the limitations, but these are fairly minor.

A limitation here is the very small number of needle samples taken for biochemical analysis - only 2 needles for M2 and M3 - what were the numbers for others? Chlorophyll content can vary quite a lot between different cohorts of needles, so the resulting scatter plots are essentially extrapolations from 2 needles only. I'm not sure this is useful. Fig 2 shows this variability (in part) - although of course the fact is that the laser will return signals from multiple needles even for a single pulse. A 5 mm beam diameter

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is much larger than a single needle. What are the implications of this? There will also be significant multiple scattering and shadowing at needle scale. Using spectral ratios may average this effect out but it's still there. This means all results are a function of the spot size relative to the needle size. This issue ought to be discussed and quantified if possible, or at least discussed. Given the work is intended to look at small targets and the chemical analysis has been done on a very small sample of these, I think this needs investigation.

One other question here is why use spectral ratios at all? These are purely empirical and no rationale is given as to why one or other might be used. What kind of results are we to expect? There are of course spectral models of needle reflectance properties which might be more appropriate to use in analysis like this eg the LIBERTY needle model of Dawson et al.

Minor points p15020 line19 - phenology is periodic anyway by definition i.e. it's not seasonal changes in phenology, it's just phenology. p15021 l5: worth mentioning work of Asner here - has done a lot of this at large scale i.e. combining spectral and lidar. p15022 l15: why are these details approximate (scan resolution)? Fig 1 - a scale would be useful, as would some indication of the accuracy of the co-registration. In addition, can the branches that are sampled be marked? Fig 3 - I'm not sure R2 values to 5 decimal places are useful. Also, can error bars be added to the scatter plots in fig 3-6?

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