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Biogeosciences Discussions

Interactive comment on "Towards spatial assessment of carbon sequestration in peatlands: spectroscopy based estimation of fractional cover of three plant functional types" *by* G. Schaepman-Strub et al.

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Answers to comments by Anonymous Referee #2

We appreciate the constructive and helpful comments by Anonymous Referee #2. We discuss the reproducibility with respect to the sampling design and its implications for the application of the presented methodology to discriminate among vegetation types in peatlands. Please find our answers to the specific comment below.

R #2. However I have some major concerns about the reproducibility of the results obtained by this ms. While the paper is analytically sound it definitively fails in applying

a robust sampling design.

A. We use the spectral unmixing method to decompose source spectra into a set of endmember spectra expressed as abundances. Spectral umixing is an inverse problem mathematically solving the physical based linear mixture equation using the least squares approach. Given the physical nature of the approach no calibration data is needed. Fig 3 and correlations depicted in Table 2 validate our findings (not calibration), showing expected uncertainties of the methodology under given conditions, i.e., within the range of vegetation cover of different plant functional types as present on the research site. The sampling design of this study was chosen to cover relevant abundances of dominant species mixtures observed in this area, including situations where the assumption of linear mixture may reach its limits (for example for a low shrub cover), thus including cases with expected higher retrieval uncertainty. The presented stratified sampling approach relies on covering the entire range of abundances of plant functional type fractional cover along the water table gradient (i.e. from sphagnum-dominated patches at high water table to shrub-dominated low water table sites, with three intermediate, more equally distributed plant functional type abundances). The stratified sampling approach was chosen to test the applicability of the physical based algorithm, including all potential situations. The 25 sites selected represent the whole range of plant functional type fractional cover, as intended by the sampling design of the study.

We acknowledge that under less optimal conditions (e.g., very noisy data, less optimal endmember selection (such as not covering all abundant sphagnum communities), or using airborne data without atmospheric compensation), higher uncertainties might result due to further increasing the ill-posedness of the inverse problem. It is only recommended to transfer the presented endmember spectra or correlations as presented in Table 2 to other research sites, when working with similar abundances of species. Otherwise we suggest adapting the analysis to the area of interest by using in situ endmember reflectance spectra; or alternatively, laboratory measured endmember

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spectra of individual species (also known as spectral libraries). The robustness of the presented approach depends only on the endmember selection and can be transferred to any other location when using similar species compositions.

The above aspects are added to the discussion and conclusions section of the manuscript, and the usage of the term ’representative’ is revised.

Interactive comment on Biogeosciences Discuss., 5, 1293, 2008.