Biogeosciences Discussions

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Comment on bg-2021-218

Anonymous Referee #1

Referee comment on "Thirty-eight years of CO_2 fertilization have outpaced growing aridity to drive greening of Australian woody ecosystems" by Sami W. Rifai et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2021-218-RC1, 2021

This is an important paper and is a novel and interesting analysis of the magnitude of the CO2 fertilisation effect on changes to green cover despite drought, fire and LUC across the forests of eastern Australia. It was well written and uses a statistical approach (as opposed to a ecosystem model) to separate the relative impact of drought on the CO2 fertilisation. Clever analysis, novel presentation of results (eg Figure 1) and was very well written.

The only issue I had was with the coarse resolution remote sensing product that was used to determine cover change.
L50 The Landsat based green vegetation fractional cover product (GV) is potentially superior to NDVI and I am wondering why this was not used. Monthly data are available from GeoSci Australia's data cube at 25 m resolution and is derived from Landsat 5 TM, ETM and OLI from 1987 onwards and are geometrically corrected, converted to surface reflectance, adjusted for solar illumination and viewing angles and masked for cloud and cloud shadow (see Lewis et al 2017, Gill et al 2017). The data are 'analysis ready' and this product is likely too be superior to NDVI and includes fractional bare soil and non-photosynthetic cover ideal for the analysis of drought impacts. Earlier imagery could be used to get back to 1982.

The fractional cover is at a far higher resolution (~25 m) and is a sub-pixel fraction and provides a finer-grained information than NDVI. NDVI is sensitive to saturation at the high cover, and is sensitive to variation in vegetation structure (i.e., bare ground), differences in canopy openness and complex seasonality associated with overstorey and understorey veg components. The fractional cover product also avoids dealing with both the AVHRR NDVI and MODIS NDVI data.

The Discussion was excellent and drew the threads together well, and highlighted the notion that examining response of Australian vegetation will be helpful for other assessing impacts from other vegetation systems globally. While Australian focused, the approach and outcomes is of global significance.

So accept subject to consideration of using fractional cover. The next study could be

useful to look at potential decrease in understory vegetation as overstory thickens. This has implication for prodciutvity and biodiversity.