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Geoscientific Model Development Discussions
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Interactive comment on "Vegetation distribution and terrestrial carbon cycle in a carbon-cycle configuration of JULES4.6 with new plant functional types" *by* Anna B. Harper et al.

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This manuscript presents changes to the TRIFFID vegetation dynamics module of the JULES land surface model. In general I found the manuscript to represent a significant advance, with good documentation , clear evaluation and a summary of how the new configuration of JULES simulates historical terrestrial carbon balance.

I recommend the manuscript as a valuable contribution to GMD, subject to a few comments below being addressed:

1. Line 160-165. What are the observational rages for aw1 and aws. Are the adjusted

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Discussion paper

values within observed ranges? How applicable are fixed values of these parameters for stands of different ages, and what are the implications for carbon accumulation in young vs old-growth forests?

2. Biomass from Ruesch and Gibbs (2008). Could you justify why you don't use more up-to-date biomass products, eg GEOCARBON (Avitabile et al. 2016), https://www.wur.nl/en/Expertise-Services/Chair-groups/Environmental-Sciences/Laboratory-of-Geo-information-Science-and-Remote-Sensing/Research/Integrated-land-monitoring/Forest_Biomass.htm

3. Figure 1. What quantity is being mapped ? Is it area fraction? Please make it clear in the text and figure caption.

4. L340. If the agricultural land is prescribed, how can the model under-estimate it?

5. L. 435. "in agreement with the high bias in simulated NPP". Please revise this stated agreement. High bias in NPP doesn't necessarily give high NBP. It is the magnitude NPP, relative to that of heterotrophic respiration that dictates the magnitude of the land carbon sink, with the difference related to the different rates of change of these two fluxes.

6. Figure SM7: different colours or line-styles are needed to distinguish the two simulations.

7. Can you explain why biomass in central Africa is well simulated (Fig. 3-4), but vegetation distribution is not (Fig 1).

8. Satellite-based NPP. Please consider referencing uncertainty in this product, for example, satellite-based NPP datasets have large uncertainties in tropical regions (Cleveland et al. 2015), e.g. from saturation of the fraction of photosynthetically active radiation (FPAR) in high vegetation density areas.

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