Earth Syst. Sci. Data Discuss.,
https://doi.org/10.5194/essd-2020-148-AC8, 2021

Open Access Earth System Science Data Discussions

Interactive comment on "The global forest above-ground biomass pool for 2010 estimated from high-resolution satellite observations" *by* Maurizio Santoro et al.

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Received and published: 18 January 2021

1) The original pixel size was equivalent to a square of approximately 25 m on each side on the ground. Averaging to 1 hectare implied a 4 x 4 window size. The area covered by the 16 pixels within 1 hectare was associated with the average AGB from the 16 pixels.

2) Unlike most forests, where backscatter increases with increasing biomass, the relationship for mangroves can be substantially different. In Figure SC1, we illustrate ALOS PALSAR backscatter observations as a function of mangrove height, defined as the elevation of mangroves in the Shuttle Radar Topography Mission (SRTM) C-band

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dataset. Assuming AGB is directly proportional to canopy height, it is reasonable to assume that the same patterns apply to the relationship between SAR backscatter and AGB. At several locations we observed lower backscatter in dense mangroves than in surrounding mangroves with lower biomass. This cannot be reproduced by the Water Cloud Model used in our study, since the model always gives higher canopy backscatter with increasing; hence inversion of the Water Cloud Model assigned low biomass to dense mangroves.

One way to overcome this problem would be to implement mangrove-specific training of the Water Cloud Model; however, this runs the risk of an erroneous estimate of the model parameter representing the ground backscatter. Alternatively, one could rely on other sources of remote sensing data, such as interferometric height proposed by Simard et al., 2019. Unfortunately, a global interferometric dataset was not available for the 2010 decade at the time of study. In conclusion, we do not see an optimal global solution for improving the AGB estimates for mangroves and suggest that the GlobBiomass AGB over mangrove areas is used with caution because of potential underestimates.

This discussion for mangroves applies to any forest structure in principle. While some are modelled best with the proposed Water Cloud Model (e.g., boreal forests), some others may suffer systematic errors due to the simplified parameterization of the model. The choice of the model is, however, subordinate to the observations available. A few observations of the radar backscatter at C- and L-band limit the performance of a retrieval model, whatever its formulation may be because of the vertical structure of the forest is not captured in its full extent. Observations sensitive to forest structure from spaceborne laser or longer wavelength radar will overcome this issue. This aspect was briefly introduced at the end of the manuscript and has been revisited in the revision in order to duly account for this comment and have it discussed from a more general perspective.

3) The BEF only refers to above-ground biomass, i.e. expansion from stem biomass to

total above-ground biomass density. We have added above-ground in the manuscript to avoid confusion.

References

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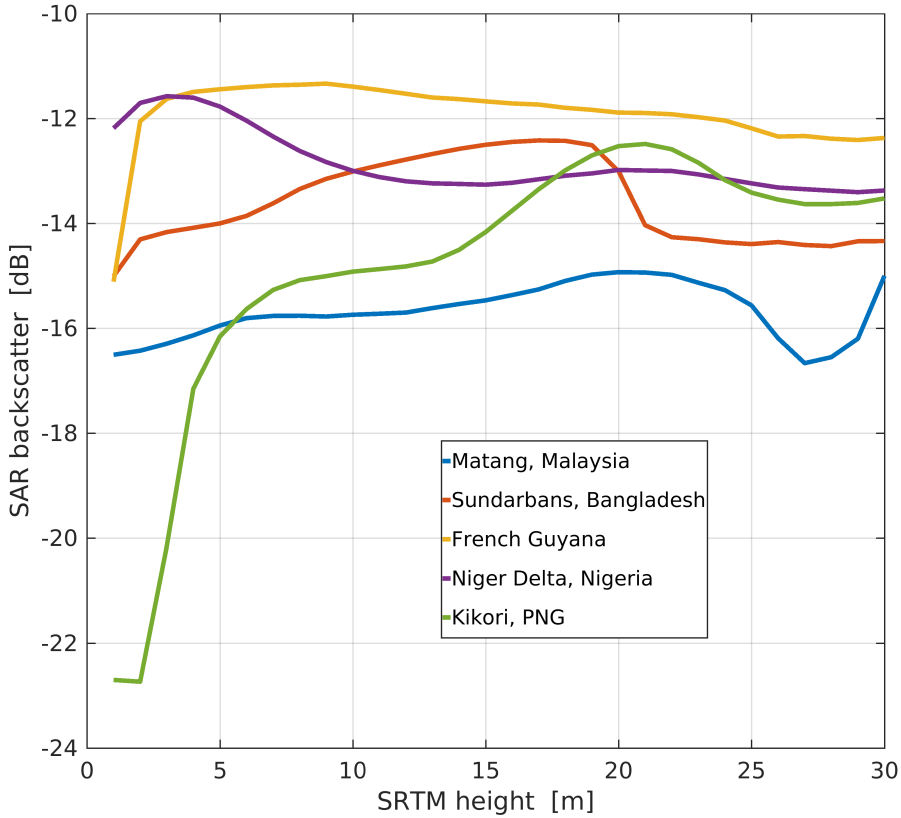

Fig. 1. Median backscatter as a function of Shuttle Radar Topography Mission (SRTM) elevation for five locations labelled as mangroves by the Global Mangrove Watch classification (Bunting et al., 2018).