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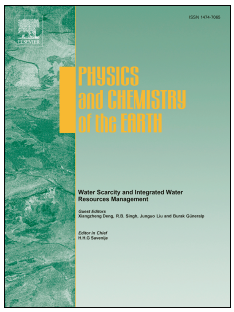

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PII: S1474-7065(17)30117-1

DOI: 10.1016/j.pce.2018.03.007

Reference: JPCE 2668

To appear in: *Physics and Chemistry of the Earth*

Received Date: 17 April 2017

Revised Date: 1 February 2018

Accepted Date: 22 March 2018

Please cite this article as: Dube, T., Masocha, M., Shoko, C., Estimating soil organic and aboveground woody carbon stock in a protected dry Miombo ecosystem, Zimbabwe: Landsat 8 OLI data applications, *Physics and Chemistry of the Earth* (2018), doi: 10.1016/j.pce.2018.03.007.

Estimating soil organic and aboveground woody carbon stock in a protected dry Miombo ecosystem, Zimbabwe: Landsat 8 OLI data applications

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Abstract

Accurate and reliable soil organic carbon stock estimation is critical in understanding forest role to regional carbon cycles. So far, the total carbon pool in dry Miombo ecosystems is often under-estimated. In that regard this study sought to model the relationship between the aboveground woody carbon pool and the soil carbon pool, using both ground-based and remote sensing methods. To achieve this objective, the Ratio Vegetation Index (RVI), Normalized Difference Vegetation Index (NDVI), and the Soil Adjusted Vegetation Index (SAVI) computed from the newly launched Landsat 8 OLI satellite data were used. Correlation and regression analysis were used to relate Soil Organic Carbon (S.O.C), aboveground woody carbon and remotely sensed vegetation indices. Results showed a soil organic carbon in the upper soil layer (0-15cm) was positively correlated with aboveground woody carbon and this relationship was significant ($r = 0.678$; $P < 0.05$) aboveground carbon. However, there were no significant correlations ($r = -0.11$, $P > 0.05$) between SOC in the deeper soil layer (15-30 cm) and aboveground woody carbon. These findings imply that (relationship between aboveground woody carbon and S.O.C) aboveground woody carbon stocks can be used as a proxy to estimate S.O.C in the top soil layer (0-15cm) in dry Miombo ecosystems. Overall, these findings underscore the potential and significance of remote sensing data in understanding savanna ecosystems contribution to the global carbon cycle.

Keywords: carbon pool, soil layer, tree height, vegetation indices, woody biomass, satellite data

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