Comparison of estimation results of aboveground biomass using different allometric equations in a lowland Dipterocarp forest, Peninsular Malaysia

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Accurate forest carbon stock estimation is indispensable to implement a REDD+ project. To date, many allometric equations have been developed to estimate aboveground biomass (AGB) around the tropical forests. In this study, we compared estimation results of AGB between locally developed equation (Kato et al; 1978) and general equation developed by Chave et al. (2005) using a tree census data from 6-ha plot in lowland Dipterocarp forest, Peninsular Malaysia. To use the general equation, we had also calculated species specific wood densities for each tree species in the plot. The results of applying the locally developed equation, without wood density parameter, showed relatively low value (ca. 8%) than those of the general equation. Some heavy hardwood tree species (e.g. *Dipterocarpus crinitus* and *Koompassia malaccensis*) were causing differences in estimation results. On the other hand, many light hardwood tree species (e.g. *Melicope glabra* and *Endospermum diadenum*) had emerged and dominated within secondary patch where clear cutting had conducted in the early 1970s, and showed overestimated values by the locally developed equation due to lack of wood density data. Our results imply that selection of ineligible allometric equation could lead to inaccurate AGB estimation in secondary forests. Moreover, tree species identification is also important to evaluate forest carbon stocks on a regional scale using combination of remote sensing data and ground-based inventory.

Modelling the spatial variation in above ground carbon stocks in Zimbabwe's dry indigenous forests

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The above ground carbon pool in Zimbabwe's dry indigenous forests is often unknown and under-estimated. This is often as a result of limited resources to carry out large scale forest inventories. Moreover, most work on the estimation of forest carbon stocks have mainly focused on tropical rainforests. In that regard this study sought to close that gap by modelling the relationship between in-situ field based Above Ground-Biomass measurements and satellite data. To achieve this objective, satellite reflectance values of Bands 3, 4 and 8, the Difference Vegetation Index (DVI), Ratio Vegetation Index (RVI), Normalized Difference Vegetation Index (NDVI) and the Soil Adjusted Vegetation Index (SAVI) were computed from Sentinel satellite data of June 2018. Correlation and regression analysis were then used to relate field based carbon measurements and remotely sensed parameters. Results showed that NDVIhad the most significant positive relationship with field based carbon measurements (r^2=0.72; $p < 0.05$) thus it can be used as a proxy for carbon estimation in Zimbabwe's dry indigenous forests. These findings underscore the potential and significance of remote sensing data in particular Sentinel in understanding and quantifying carbon stocks in Zimbabwe's dry indigenous forests.

First mission – towards a global harmonised in-situ data repository for forest biomass datasets validation

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Global measurements of forest height, biomass are urgently needed as essential climate and ecosystem variables, but can benefit from greater co-operation between remote sensing (RS) and forest ecological communities. The Forest Observation System – FOS (https://forest-observation-system.net/ [https://forest-observation-system.net/]) is an international cooperation to establish a global in-situ forest biomass database to support earth observation and to encourage investment in relevant field-based observations and science. FOS aims to link the RS community with ecologists who measure forest biomass and estimating biodiversity in the field. The FOS aims to overcome data sharing issues and introduce a standard biomass data flow from tree-level measurement to the plot-level aggregation served in the most suitable form for the RS. Ecologists benefit from the FOS with improved access to global biomass information, data standards, gap identification and potentially improved funding opportunities to address the known gaps and deficiencies in the data. FOS closely collaborate with the CTFS-ForestGEO, the ForestPlots.net (incl. RAINFOR, AfriTRON and T-FORCES), AusCover, TmFO and the IIASA network. FOS is an open initiative with other networks and teams most welcome to join. The online database provides open access for forest plot location, canopy height and above-ground biomass. Plot size is 0.25ha or larger. Comparison of plot biomass data with available global and regional maps (incl. Kindermann et al., 2013; Thurner et al., 2013; Saatchi et al., 2011; Baccini et al., 2012; Avitabile et al., 2016; Hu et al., 2016; Santoro et al., 2018) shows wide range of uncertainties associated with biomass estimation.

Understanding the disturbance dynamics of forests using time-series remote sensing

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Time series remote sensing can be used to map trends and changes in forests over time. This research utilises long time series Landsat imagery to map and examine disturbance events, and subsequent recovery, over 8.2 million hectares of sclerophyll forest in SE Australia. All available Landsat TM imagery (1988-2017) for southern hemisphere summer months was used to create annual composites of six vegetation indices (using LandsatLinkR) across 19 WRS Landsat tiles. The spectral trajectory of each index was extracted on a per pixel basis over the 30-year period, and used to characterise the disturbance-recovery dynamics of forests. A reference dataset consisting of 8,000 training pixels and 786 permanent plots were then created to attribute disturbance events using a multiple lines of evidence approach. This was then used to prime a set classifiers (Random Forest) and map disturbance and recovery by severity/completeness of recovery and agent of change: logging (clear fell and selective logging), fire (wildfire and prescribed burning), low severity disturbance including pests, flooding, drought and