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iForest – Biogeosciences and Forestry – doi: 10.3832/ifor4720-018

Supplementary Material

Fig. S1 - LiDAR point cloud processing for shrub detection. (a) refinement of points; (b) soil (2) and non-soil (0) classifications; and (c) cloud normalized with the digital elevation model.

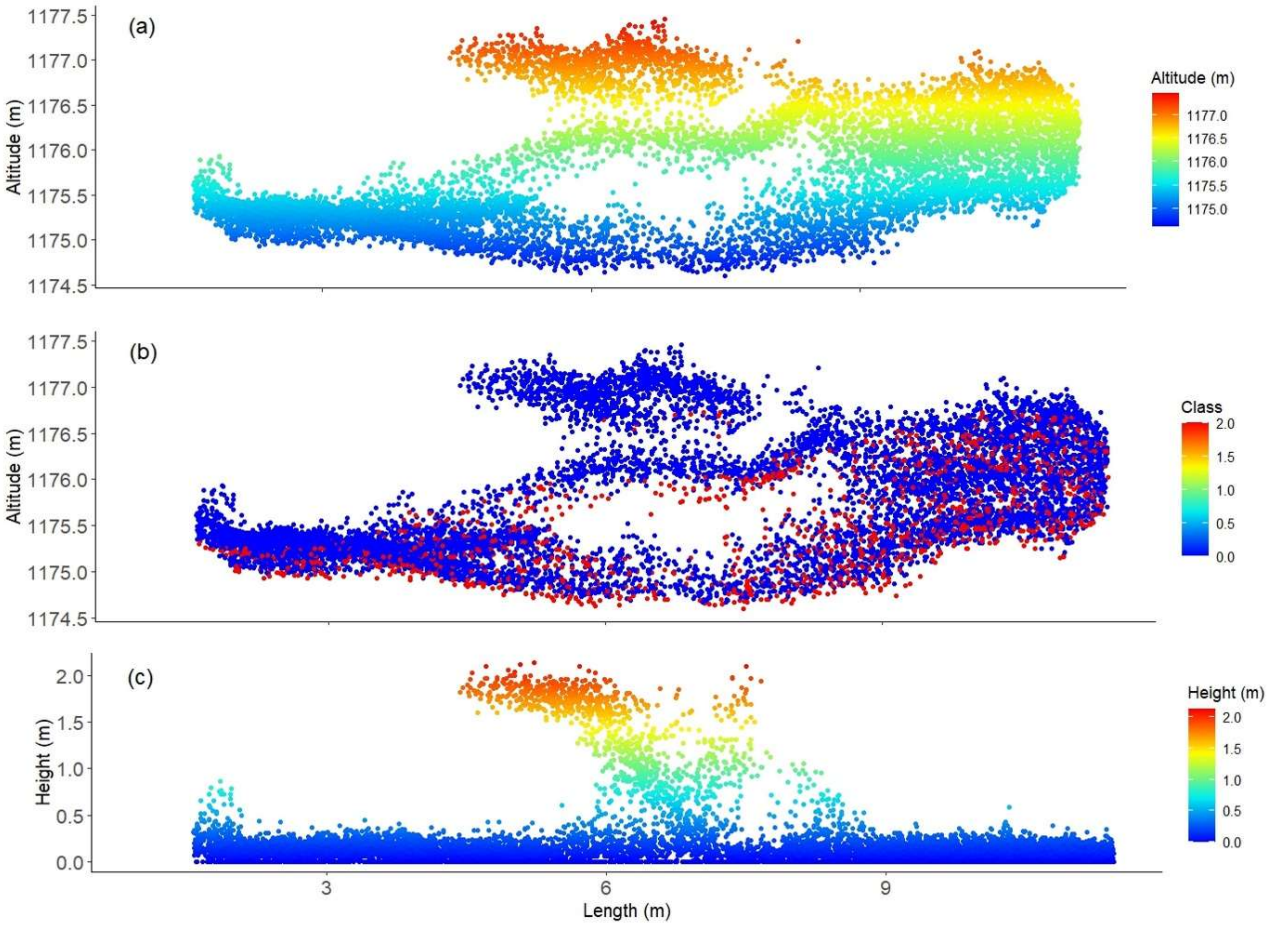


Fig. S2 - Detection of shrubs in a xerophytic shrubland. (a) Cross-sectional view, (b) horizontal slice of the segmented LiDAR point cloud, and (c) view of shrubs detected in the ultra-resolution RGB image.

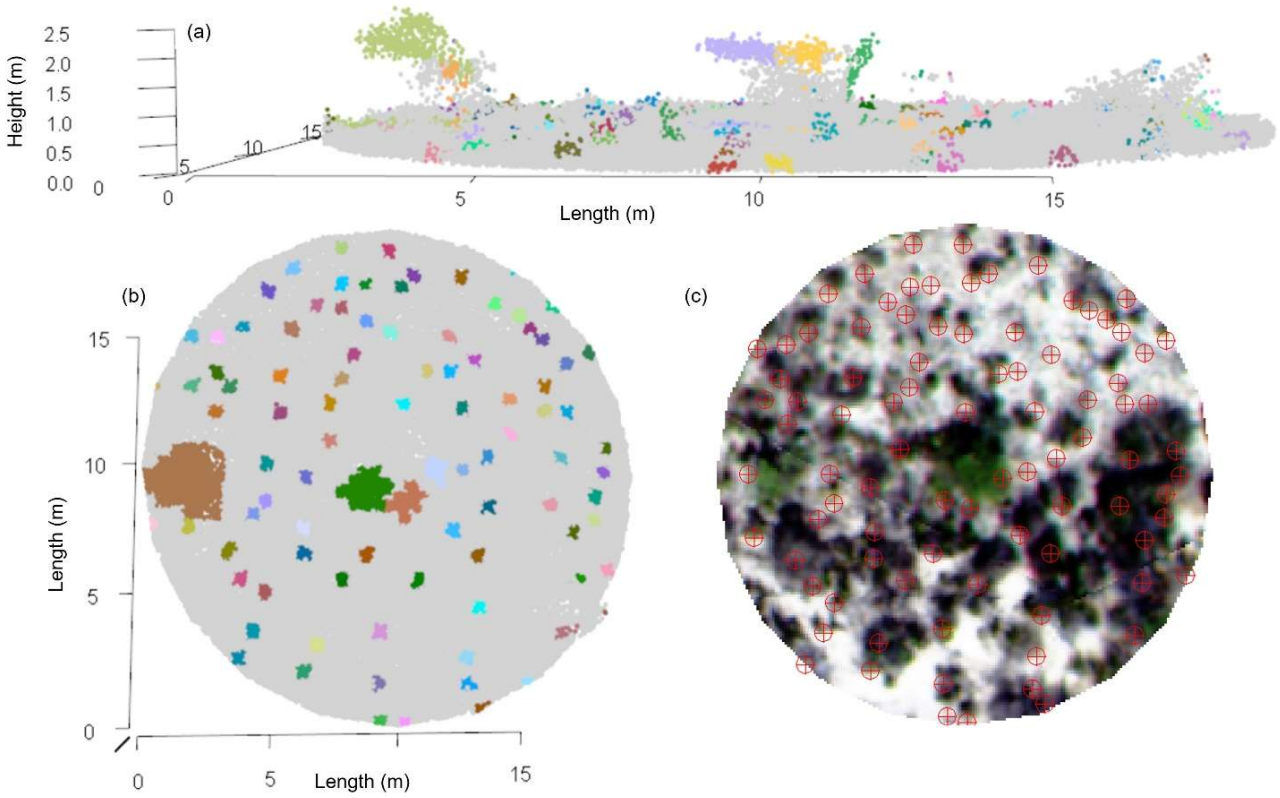
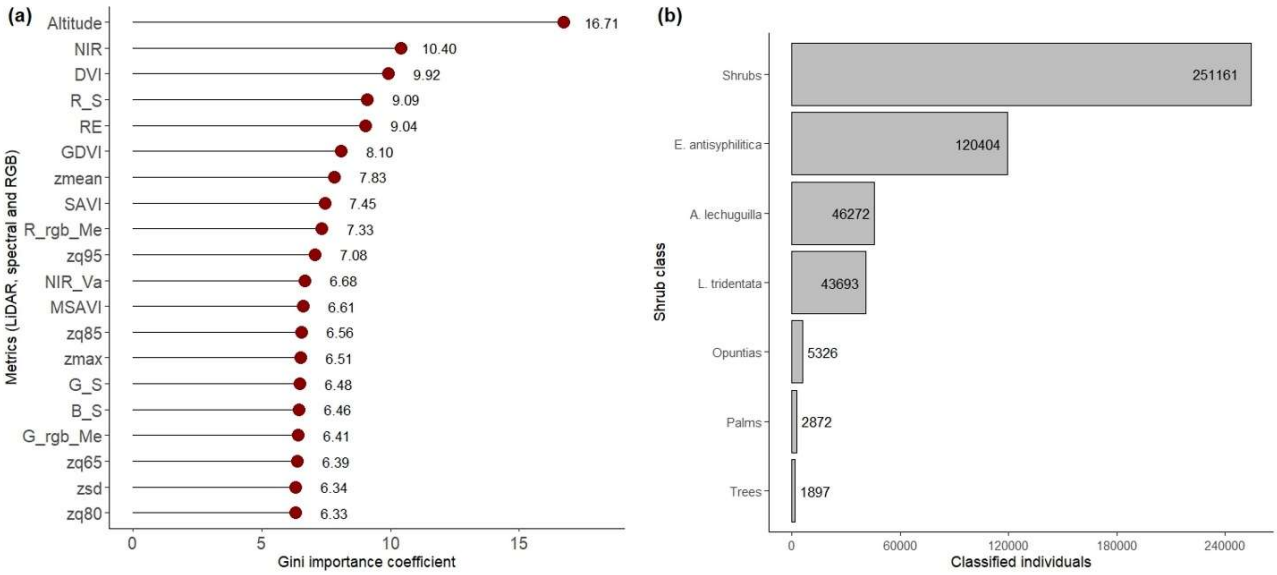


Fig. S3 - Significance Gini value of LiDAR, spectral, and RGB metrics in the classification with the Random Forest model (RF) (a). Frequency of classified species and shrub groups (b). (R): red; (G): green; (B): blue; (S): spectral data; (rgb): RGB data; (Me): mean; (Va): variance.



Tab. S1 - Vegetation indices extracted from high resolution spectral and RGB data obtained with drones. (VI): vegetation index; (NIR): near infrared; (RS): red spectral band; (GS): green spectral band; (Rrgb): red RGB coloring; (Grgb): green RGB coloring; (Brgb): blue RGB coloring.

VI spectral	Formula	VI RGB	Formula
Normalized differential VI	$NDVI = \frac{NIR - R_S}{NIR + R_S}$	Green-red VI	$GRVI = \frac{R_{rgb} - G_{rgb}}{R_{rgb} + G_{rgb}}$
Ratio VI	$RVI = \frac{NIR}{R_S}$	Red-green-blue VI	$RGBVI = \frac{(G_{rgb} \cdot G_{rgb}) - (R_{rgb} \cdot B_{rgb})}{(G_{rgb} \cdot G_{rgb}) + (R_{rgb} \cdot B_{rgb})}$
Differenced VI	$DVI = NIR - R_S$	Green leaf index	$GLI = \frac{(G_{rgb} - R_{rgb}) + (G_{rgb} - B_{rgb})}{(2 \cdot G_{rgb}) + R_{rgb} + B_{rgb}}$
Soil adjusted VI	$SAVI = \left(\frac{NIR - R_S}{NIR + R_S + 0.5} \right) \cdot 1.5$	Atmospheric visible resistance index	$VARI = \frac{G_{rgb} - R_{rgb}}{G_{rgb} + R_{rgb} - B_{rgb}}$
Modified soil adjusted VI	$MSAVI = \frac{2\,NIR + 1 - \sqrt{(2\,NIR + 1)^2 - 8\left(\frac{NIR}{-R_S}\right)}}{2}$	Normalized green-red difference index	$NGRDI = \frac{G_{rgb} - R_{rgb}}{G_{rgb} + R_{rgb}}$
Green chlorophyll index	$GCI = \left(\frac{NIR}{G_S} \right) - 1$		
Green difference VI	$GDVI = NIR - G_S$		
Green proportion VI	$GRVI = \frac{NIR}{G_S}$		
Green normalized differential VI	$GNDVI = \frac{NIR - G_S}{NIR + G_S}$		