Supplementary information

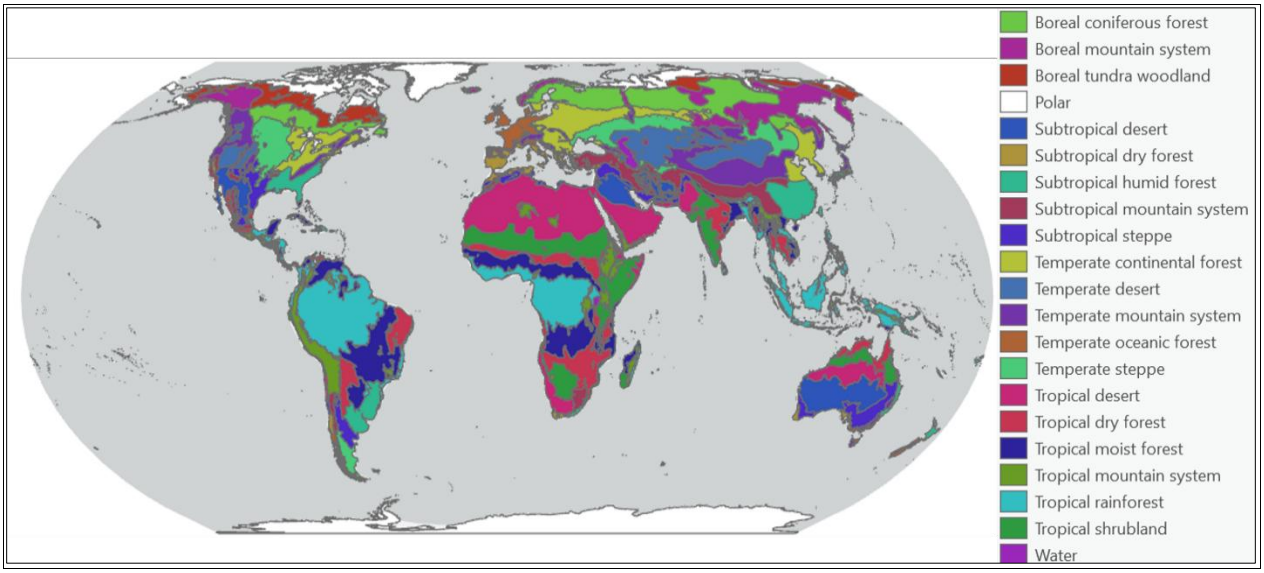

Figure S1. Global ecological zones used for ecozone-specific model development. Global map of terrestrial ecological zones are used to stratify model training and evaluation in this study. For the modeling framework, the ecozone layer was spatially overlaid with the global forest extent mask for 2020, and model training and prediction were conducted only within forested areas. For visualization purposes, the full ecozone layer is shown here across all terrestrial regions. Ecozone boundaries follow the FAO Global Ecological Zones (GEZ) classification used for global forest assessments.

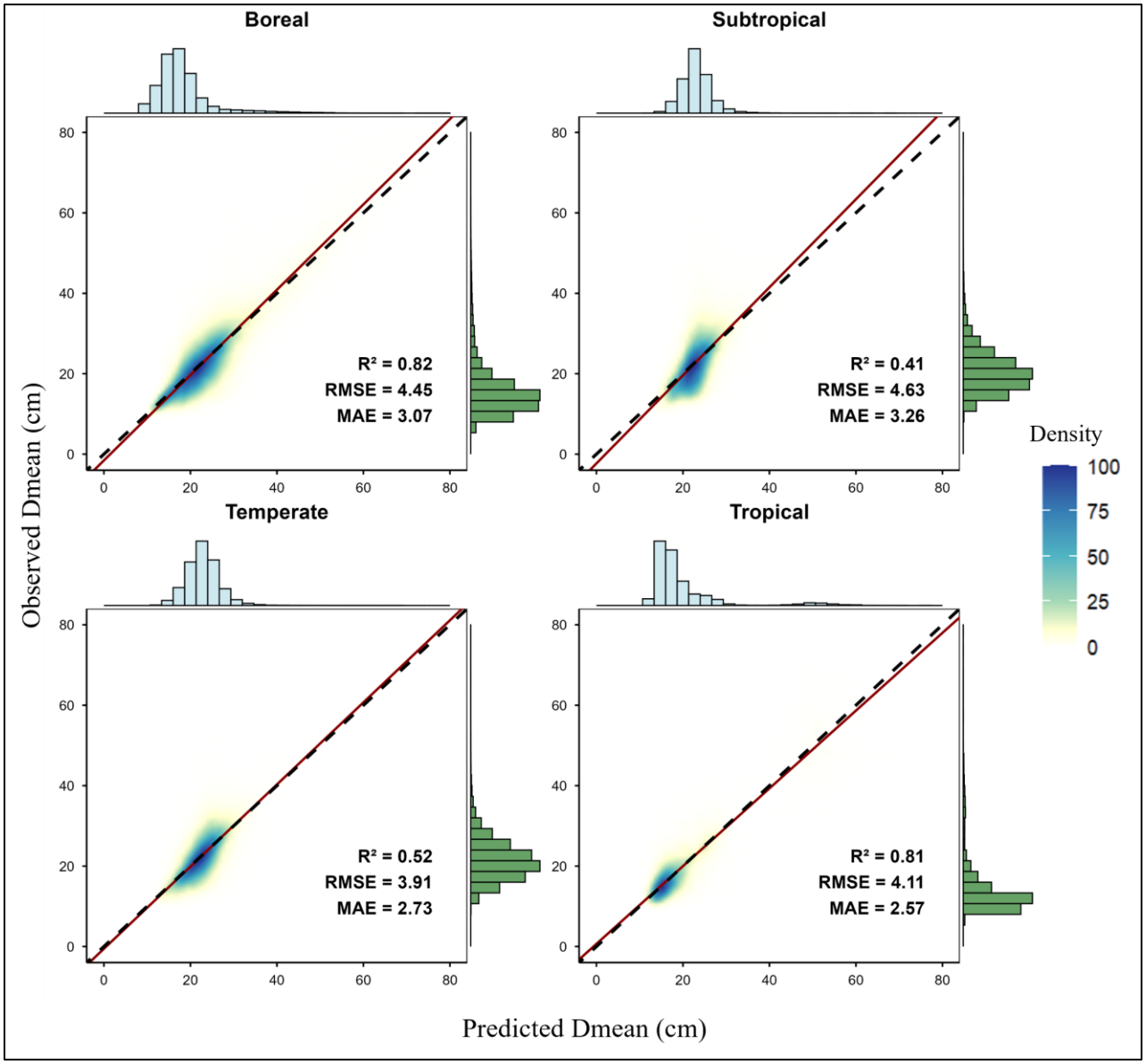

Figure S2. Cross-validation density plot of global forest mean diameter (D_{mean}) predictions using Random forest model. Panels show the relationship between observed and model-predicted values for the broader group of ecozone. The solid maroon line indicates the fitted linear regression between predicted and observed values, while the dashed black line represents the 1:1 reference line corresponding to perfect agreement. Marginal histograms are shown along the top and right axes of each panel, illustrating the distributions of predicted values (top; light blue) and observed values (right; green), respectively.

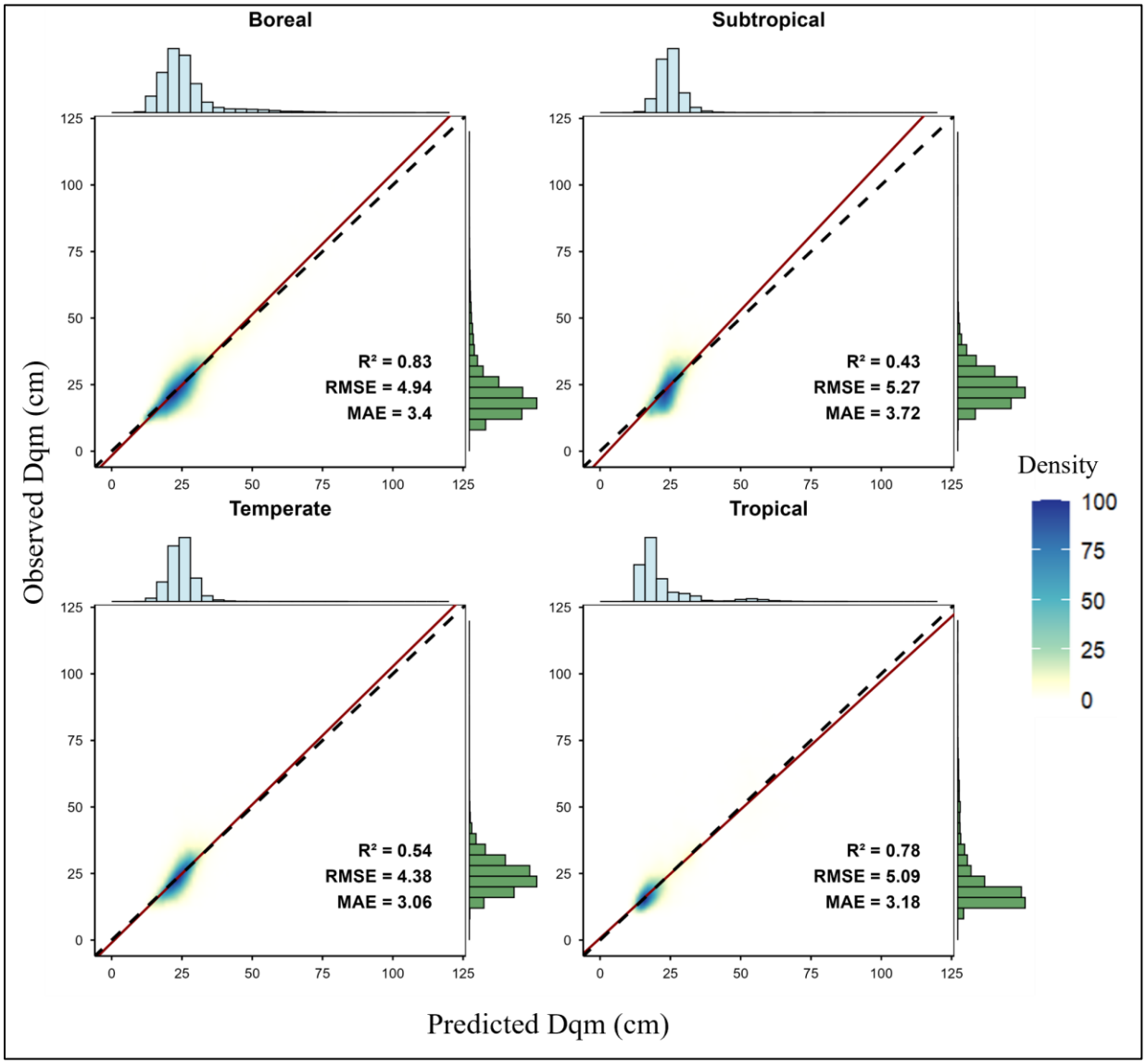

Figure S3. Cross-validation density plot of global forest quadratic mean diameter (D_{qm}) predictions using Random forest model. Panels show the relationship between observed and model-predicted values for the broader group of ecozone. The solid maroon line indicates the fitted linear regression between predicted and observed values, while the dashed black line represents the 1:1 reference line corresponding to perfect agreement. Marginal histograms are shown along the top and right axes of each panel, illustrating the distributions of predicted values (top; light blue) and observed values (right; green), respectively.

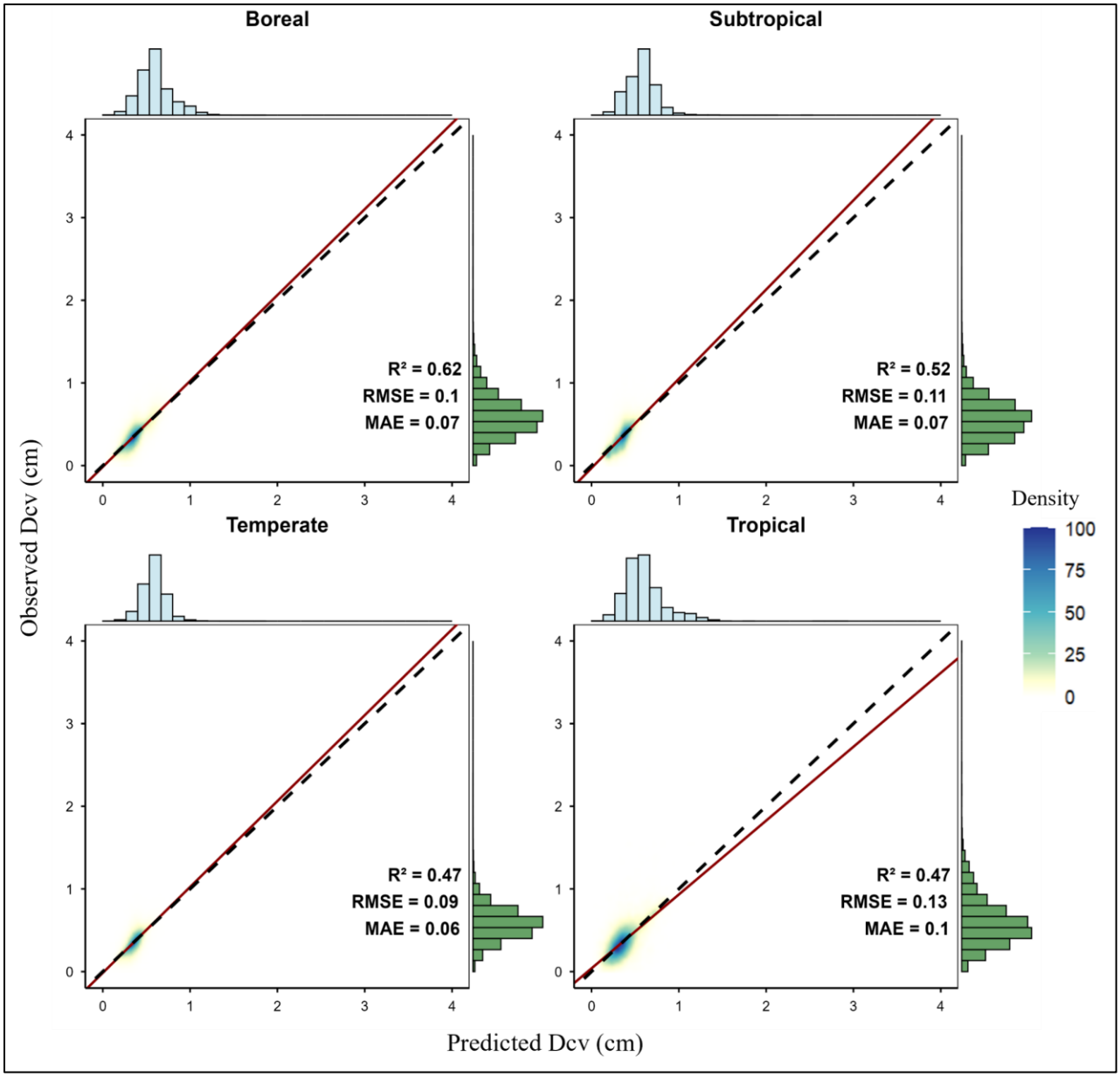

Figure S4. Cross-validation density plot of global forest coefficient of variation of diameter (D_{cv}) predictions using Random forest model. Panels show the relationship between observed and model-predicted values for the broader group of ecozone. The solid maroon line indicates the fitted linear regression between predicted and observed values, while the dashed black line represents the 1:1 reference line corresponding to perfect agreement. Marginal histograms are shown along the top and right axes of each panel, illustrating the distributions of predicted values (top; light blue) and observed values (right; green), respectively.