This repository contains data and code underlying the manuscript “Impact of leaf phenology on estimates of aboveground biomass density in a deciduous broadleaf forest from simulated Global Ecosystem Dynamics Investigation (GEDI) lidar” (Cushman et al 2023 Environ. Res. Lett. https://doi.org/10.1088/1748-9326/acd2ec).

Included files are:

- CushmanEtAl_LeafPhenologyGEDI.R: R script to predict AGBD from GEDI L4A models, assess systematic prediction differences, and create results tables and figures

- CandidateModels.csv: details of GEDI L4A models used to predict AGBD
    - Column names:
        - FileName: Original model object file name
        - Restriction: The feature set for the model (described in Methods section 2.5)
        - Intercept: Fitted model intercept
        - Var#: predictor variables 1-4
        - a-d: Fitted parameters associated with predictor variables 1-4
        - TransfVar: Transformation applied to predictor variables
        - TransfAGB: Transformation applied to biomass values
        - BackTransf: Backtransformation correction applied to model predictions
        - RH_##: Whether each relative height metric was included in the model
        - LowestRH: Smallest relative height metric included in the model
        - TallestRH: Largest relative height metric included in the model
        - RMSE_On: RMSE of predicted biomass from leaf-on data (calculated by running CushmanEtAl_LeafPhenologyGEDI.R) in % of site mean biomass
        - RMSE_Off: RMSE of predicted biomass from leaf-off data(calculated by running CushmanEtAl_LeafPhenologyGEDI.R) in % of site mean biomass
        - Bias_On: : Bias of predicted biomass from leaf-on data (calculated by running CushmanEtAl_LeafPhenologyGEDI.R) in % of site mean biomass
        - Bias_Off:: Bias of predicted biomass from leaf-off data (calculated by running CushmanEtAl_LeafPhenologyGEDI.R) in % of site mean biomass
        - ModelID: Unique identifier for each row

- LeafOnSimulatedMetricsAndBiomass.csv: simulated GEDI RH metrics from leaf-on conditions and field-estimated aboveground biomass density
    - Column names: See documentation for the GEDI waveform simulator (https://bitbucket.org/StevenHancock/gedisimulator/src/master/).
        - A few changes/additions were made to the default column names:
            - “rhReal” metrics were renamed from “rhReal_##” to “RH_##” for all relative height metrics
            - Columns were added for interaction terms among (rhReal) relative height metrics in the form “RH_##_RH_##”
            - AGBD_Mgha: Column with the estimated biomass density associated with each footprint, from inventory plot data (Mg/ha)

- LeafOffSimulatedMetricsAndBiomass.csv: simulated GEDI RH metrics from leaf-off

conditions and field-estimated aboveground biomass density
- Column names: same as for leaf-on file above