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Readme for the data published with:

From boreal forests to boreal cities – Assessing the applicability of a forest growth and carbon balance model to tree-covered urban green spaces

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Overview

Total of six (6) csv files containing both the study site stand characteristics used to initialise the PREBASSO model runs and the key model outputs analysed in the study, alongside the corresponding remote sensing based estimates used as points of comparison in the model performance assessment.

NOTE

This is the 2nd and final version of the dataset. The 1st version is associated to the initially submitted manuscript, while this 2nd version is associated to the published article. Most of the data is the same but there were the following changes:

1. `Karvinen_etal_2026_C_fluxes_V2.csv` has slightly different values than the initial version of the file due to the fact that future scenario model runs were re-conducted during the peer-review process of the manuscript. Due to the randomisation element featured in the model spin-up, the values are therefore slightly different than in the originally published version of this file.
2. `Karvinen_etal_2026_weekly_GPP_SIF.csv` was removed as all SIF-related content was removed from the manuscript during the peer-review process. The file can still be accessed through the 1st version of this data record.
3. `Karvinen_etal_2026_tree_dimension_future.csv` is a new file added as additional analysis related to the future development of the simulated tree layers was added to the manuscript during the peer-review process.

Files

`Karvinen_etal_2026_init_stand_char.csv`

Description: Initial stand characteristics at the study sites in the year 2023 for Riihimäki and 2020 for Espoo and Forssa. These were computed based on individual trees detected from airborne laser scanning (ALS) data of the Finnish national laser scanning programme, as described in further detail in the associated manuscript, and used to set up the stand dimensions in the beginning of the model runs.

Columns:

`1. City_name`

= Name of the city

`2. Site_number`

= Number of the study site (within the city)

`3. Total_tree_n`

= Total number of trees detected within the study site

`4. Tree_percentage_pine`

= Share of pines (*Pinus sylvestris*) within the study site, calculated based on the number of tree stems, in %

`5. Tree_percentage_spruce`

= Share of spruces (*Picea abies*) within the study site, calculated based on the number of tree stems, in %

`6. Tree_percentage_broadleaf`

= Share of broadleaf trees within the study site, calculated based on the number of tree stems, in %

`7. Mean_H_pine_m`

= Mean height (H) of pines within the study site, in m

`8. Mean_H_spruce_m`

= Mean height of spruces within the study site, in m

`9. Mean_H_broadleaf_m`

= Mean height of broadleaf trees within the study site, in m

`10. Mean_CBH_pine_m`

= Mean crown base height (CBH) of pines within the study site, in m

`11. Mean_CBH_spruce_m`

= Mean crown base height of spruces within the study site, in m

`12. Mean_CBH_broadleaf_m`

= Mean crown base height of broadleaf trees within the study site, in m

13. Mean_DBH_pine_cm

= Mean diameter at breast height (DBH) of pines within the study site, in cm

14. Mean_DBH_spruce_cm

= Mean diameter at breast height of spruces within the study site, in cm

15. Mean_DBH_broadleaf_cm

= Mean diameter at breast height of broadleaf trees within the study site, in cm

16. BA_pine_m2_ha

= Basal area (BA) of pines within the study site, in m^2 ha^{-1}

17. BA_spruce_m2_ha

= Basal area of spruces within the study site, in m^2 ha^{-1}

18. BA_broadleaf_m2_ha

= Basal area of broadleaf trees within the study site, in m^2 ha^{-1}

19. BA_total_m2_ha

= Total basal area of all trees within the study site, in m^2 ha^{-1}

20. BA_broadleaf_percentage

= Share of broadleaf tree BA contributing to the total BA, in %

Karvinen_etal_2026_peakLAI_mod_obs.csv

Description: Mean of seasonal peak leaf area index (LAI) at the study sites during the model performance evaluation period, according to both model results and satellite-based observations (Sentinel-2). Both the model results and observations include the respective standard deviations (SD). Further details on how the two were computed are available in the associated manuscript and its Supplement.

Columns: 1. City_name

= Name of the city

2. Site_number

= Number of the study site (within the city)

3. LAI_mod_mean_m2m2

= Mean modelled one-sided LAI at the study site, in m^2 m^{-2}

4. LAI_mod_SD_m2m2

= Standard deviation associated to the mean modelled one-sided LAI at the study site, in m^2 m^{-2}

5. LAI_obs_mean_m2m2

= Mean satellite-observed one-sided LAI at the study site, in m^2 m^{-2}

6. LAI_obs_SD_m2m2

= Standard deviation associated to the mean satellite-observed one-sided LAI at the study site, in m^2 m^{-2}

Karvinen_etal_2026_weekly_GPP_LAI.csv

Description: Weekly means of modelled gross primary production (GPP) of the trees and satellite-observed LAI at the study sites during the model performance evaluation period. Standard deviations (SD) are shown for both the model results and the observations. Also, the number of daily values used to compute the weekly means are included. Further information is available in the associated manuscript.

Columns:

1. City_name

= Name of the city

2. Site_number

= Number of the study site (within the city)

3. Year

= Year number

4. Week

= Week number

5. GPP_n_days

= Number of daily values used to compute the weekly average of GPP

5. GPP_mod_mean_gC_m2_d

= Weekly mean of the modelled GPP, in g C m^{-2} d^{-1}

6. GPP_mod_SD_gC_m2_d

= Standard deviation associated to the weekly mean of the modelled GPP, in g C m^{-2} d^{-1}

7. LAI_n_days

= Number of daily values used to compute the weekly average of LAI

8. LAI_mod_mean_m2m2

= Weekly mean of the satellite-observed LAI, in m^2 m^{-2}

9. LAI_mod_SD_m2m2

= Standard deviation associated to the weekly mean of the satellite-observed LAI, in m^2 m^{-2}

`Karvinen_etal_2026_tree_H_growth.csv`

Description: Mean annual tree height (H) growth at the study sites during the model performance evaluation period, according to both model results and ALS based observations, separately for all three tree species featured in the study. Standard deviations (SD) are shown for the modelled means. Further information on how the variables were computed can be found in the associated manuscript.

Columns:

`1. City_name`

= Name of the city

`2. Site_number`

= Number of the study site (within the city)

`3. Tree_species`

= Identifier for different tree species with 1=pine, 2=spruce, 3=broadleaf

`4. H_growth_annual_mod_mean_m`

= Mean annual modelled tree H growth, in m

`5. H_growth_annual_mod_SD_m`

= Standard deviation associated to the mean annual modelled tree H growth, in m

`6. H_growth_annual_obs_mean_m`

= Mean annual tree H growth estimated from the ALS data, in m

`Karvinen_etal_2026_C_fluxes_V2.csv`

Description: Annual sums of modelled carbon (C) fluxes at the study sites, calculated over a number of parallel model runs. The respective standard deviations (SD) are also included. The model runs include a performance evaluation period conducted mainly with ERA5-Land reanalysis meteorological data and future climate period conducted according to two RCP scenarios. Further information available in the associated manuscript.

Columns:

`1. City_name`

= Name of the city

`2. Site_number`

= Number of the study site (within the city)

`3. Year`

= Year number

`4. Scenario`

= Identifier for the utilised meteorological driver data with "Evaluation"=Model performance evaluation period based mainly on ERA5, "RCP45"=RCP4.5 climate scenario, "RCP85"=RCP8.5 climate scenario

5. Ra_mean_gC_m2_y

= Mean autotrophic respiration (R_a), in g C m^{-2} y^{-1}

6. Ra_SD_gC_m2_y

= Standard deviation associated to the mean R_a, in g C m^{-2} y^{-1}

7. Rh_mean_gC_m2_y

= Mean heterotrophic respiration (R_h), in g C m^{-2} y^{-1}

8. Rh_SD_gC_m2_y

= Standard deviation associated to the mean R_h, in g C m^{-2} y^{-1}

9. TER_mean_gC_m2_y

= Mean total ecosystem respiration (TER, i.e. R_a + R_h), in g C m^{-2} y^{-1}

10. TER_SD_gC_m2_y

= Standard deviation associated to the mean TER, in g C m^{-2} y^{-1}

11. GPPtrees_mean_gC_m2_y

= Mean gross primary production (GPP) of the trees, in g C m^{-2} y^{-1}

12. GPPtrees_SD_gC_m2_y

= Standard deviation associated to the mean GPP of the trees, in g C m^{-2} y^{-1}

13. NEE_mean_gC_m2_y

= Mean net ecosystem exchange (NEE) of the trees, in g C m^{-2} y^{-1}

14. NEE_SD_gC_m2_y

= Standard deviation associated to the mean NEE, in g C m^{-2} y^{-1}

Karvinen_etal_2026_tree_dimension_future.csv

Description: Simulated future development of the modelled tree layers, calculated over a number of parallel model runs. The respective standard deviations (SD) are also included. The model runs include a performance evaluation period conducted mainly with ERA5-Land reanalysis meteorological data and future climate period conducted according to two RCP scenarios. Further information available in the associated manuscript.

Columns: 1. City_name

= Name of the city

2. Site_number

= Number of the study site (within the city)

3. Layer

= Number of the simulated layer. Numbers 1-3 include the layers used to initialise the model runs, while layers 4-6 are layers introduced by the model as natural regeneration of the simulated tree stands.

4. Species

= Tree species of the specific layer. Layers 4-6 are unspecified.

5. Year

= Year number

6. Scenario

= Identifier for the utilised meteorological driver data with "Evaluation"=Model performance evaluation period based mainly on ERA5, "RCP45"=RCP4.5 climate scenario, "RCP85"=RCP8.5 climate scenario

7. H_mean_m

= Mean tree height, in m

8. H_SD_m

= Standard deviation associated to the mean tree height, in m

9. DBH_mean_cm

= Mean tree diameter at breast height (DBH), in cm

10. DBH_SD_cm

= Standard deviation associated to the mean tree DBH, in cm

11. BA_mean_m2_ha

= Mean basal area (BA) of the modelled layer, in m^2 ha^{-1}

12. BA_SD_m2_ha

= Standard deviation associated to the mean BA of the modelled layer, in m^2 ha^{-1}

13. CBH_mean_m

= Mean tree crown base height (CBH), in m

14. CBH_SD_m

= Standard deviation associated to the mean tree CBH, in m