




AI4TREES

AI for Climate Sensitive Tree Growth Modelling and Maximum Carbon Segregation

Project duration: 36 months
 Start: April 1st, 2022
 Contact: refiz.duro@ait.ac.at

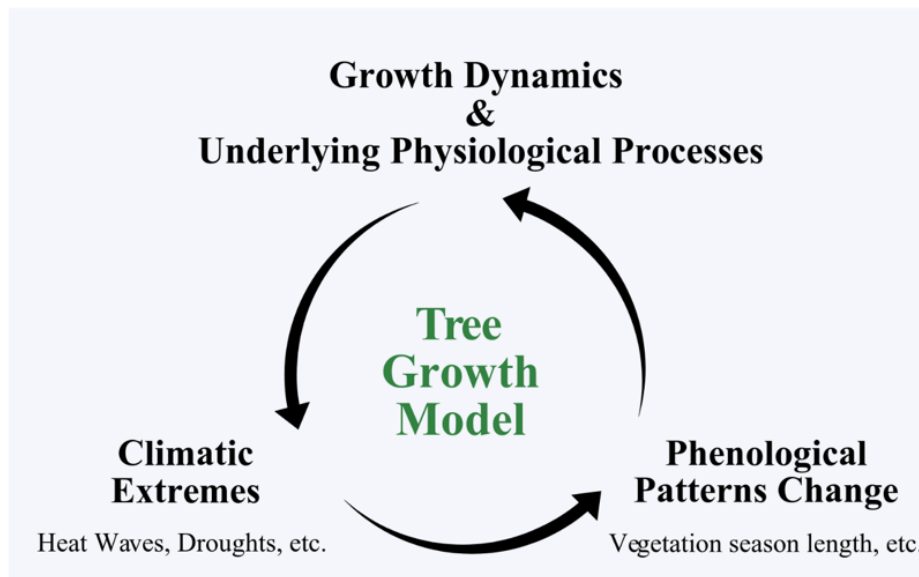


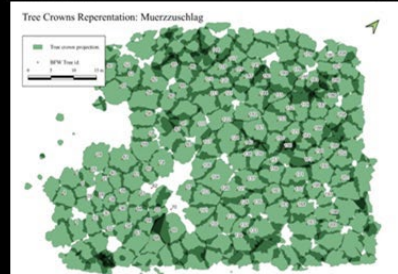
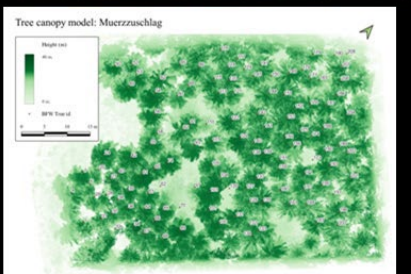
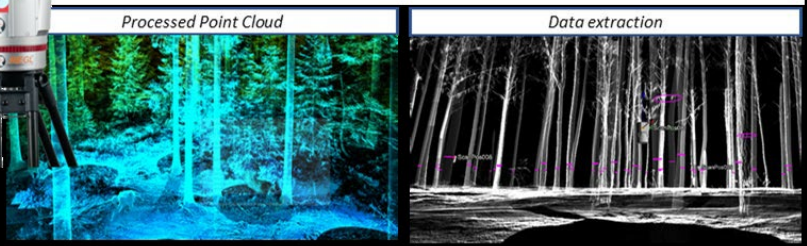
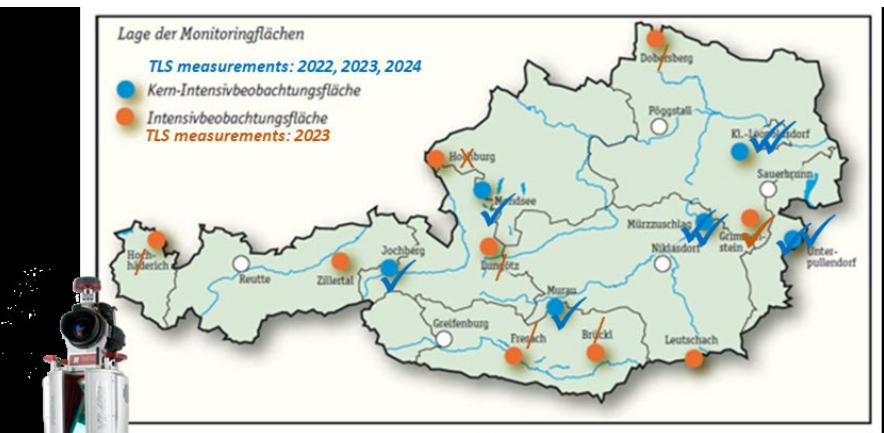
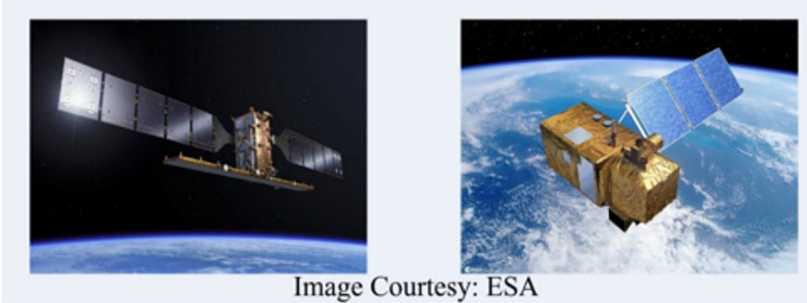
 Bundesministerium
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The developments described are carried out within the AI4Trees research project funded by the Austrian Research Promotion Agency (FFG) in the frame of the Research, Technology & Innovation (RTI) initiative “AI for Green”.

Project Goal:
Derivation of single tree growth models
 that are sensitive to climate change, hazardous disturbance, and human intervention in forest ecosystems.





Database for Modelling Sample Plot 15: Mürrzuschlagn

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27	30	-50798.6	277511.2	754.64	1	7.99	24.2	25.6	26.3	tree_0017	0.325	b8FC2F56	1.383178944
28	31	-50799.5	277508.8	752.76	1	7.46	22.6	23.6	24.7	tree_0001	0.427	b703D0A1	1.827814423
31	34	-50793.2	277512.5	758.83	1	15.38	37	38.1	38.5	tree_0015	0.475	b285C8F8	0.944679964
54	60	-50798.6	277524.8	756.03	1	10.54	23.1	23.9	24.8	tree_0044	0.302	CCCCCCC1	1.700406142
57	63	-50795.9	277519.9	753.59	1	5.78	21.3	22.1	22.9	tree_0053	0.347	d7A3703	1.880349662
70	80	-50806	277539.8	752.98	1	11.44	24.1	25.7	26.1	tree_0041	0.37	b300AD71	1.892128694
62	68	-50786.8	277515	756.75	1	12.88	26.2	27.1	27.9	tree_0093_1	0.325	d7A3703	0.85056949
81	93	-50795.9	277534.7	757.37	3	14.08	29.9	30.2	31.3	tree_0048	0.481	AE47E13	0.545971851
66	74	-50797.5	277527.7	754.81	1	13.12	26.8	28	29.1	tree_0010	0.502	E85E8513	1.158294763

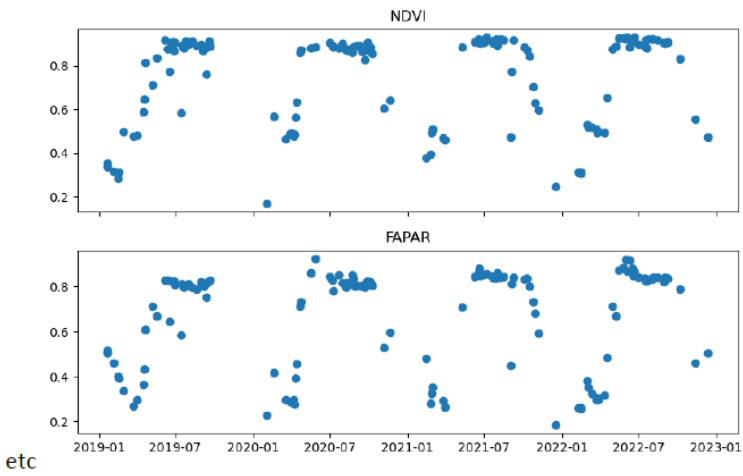
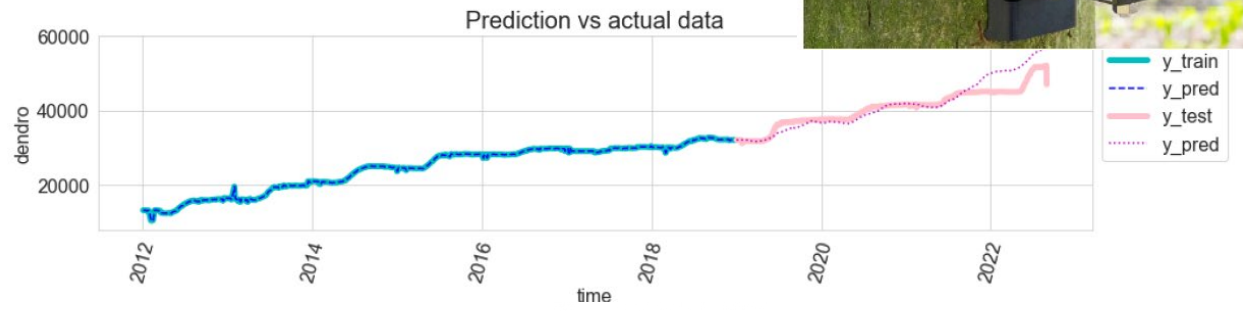


Figure 3: Sentinel2 based LAI, NDVI and fAPAR time series plots of ICP Site Klausen



AI4TREES Super admin view

https://ai4trees-project.at

AI4TREES ABOUT CONSORTIUM BLOG RESULTS LEGAL CONTACT

AI for Climate Sensitive Tree Growth Modelling and Maximum Carbon Segregation

A research project funded in the framework of the "AI for Green" programme by the Federal Ministry for Climate Protection, Environment, Energy, Mobility, Innovation and Technology (BMK).

About The Consortium

BACKGROUND MAIN CHALLENGE PROJECT GOAL

Climate change is significantly influencing Lack of climate-sensitive single tree growth Derivation of single tree growth models.

Analytics To do list

Posted by Refiz Duro • 1/12/2023

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AI for climate sensitive tree growth modelling - AI4TREES presented by Anita Zolles at LTER-Austria Yearly Conference (LTER - Österreichische Gesellschaft für ökologische Langzeitforschung). Check the poster and download it f...see more

AI4TREES Austrian Long-Term Research Infrastructure

AI4 Trees – AI for climate sensitive tree growth modelling

MOTIVATION
Changing climatic circumstances have a significant impact on forests: besides higher temperatures, more intensive and frequent storms and drought spells are major challenges for forest conservation and management in the future. European forests have been a significant carbon sink within the last decades, allowing for natural carbon dioxide removal from the atmosphere and its ability to mitigate of climate change and its consequences. Monitoring tree growth is key to better understanding tree health and carbon sequestration.

Growth Dynamics & Underlying Physiological Processes

Climatic Extremes Phenological Patterns Change

PROJECT GOAL
Growth dynamics and underlying physiological processes are at great complexity and can be challenging for traditional analysis. A tree project is to derive single tree growth change, biomass disturbance, and human disturbance.

DATA SOURCES AND METHODS

FOREST MONITORING
The basis for modelling tree growth are long time datasets covering relevant meteorological and climatic conditions at the location. CO2 fluxes are obtained by combining hourly single tree measurements and weather station data (high frequency) with the respective meteorological data (low frequency) and satellite data (low frequency), not building a single data inventory for researchers but building a single data inventory for researchers.

PARTNER ROLES

AIT: Project coordination, explainable artificial intelligence
BFW: Tree growth sensor data
UTWANT: Laser Scanning, Point cloud modelling
RINOW: Publicly accessible data science
BIOG: Model validation, Data analysis, Validation
GeoVilE: Earth Observation for vegetation and change detection

Organic impressions: 455 Impressions

How Quickly do Trees Grow?

Research And Innovation 11 January 2023 Last Updated: 11 January 2023 Hits: 469

by Refiz Duro (Austrian Institute of Technology), Hans Kirschmeir (E.C.O. Institut für Ökologie/Jungwälder), Anita Zolles (Bundesforschungs- und Ausbildungszentrum für Wald, Naturgefahren und Landschaft) and Günther Bromner (Umweltdata)

Changing climatic circumstances have a significant impact on forests: besides higher temperatures, more intense and frequent storms and drought spells affect forest growth. To see what the future is bringing, and to be able to deal with forest conservation and management, it is necessary to answer the question "how quickly do trees grow in an environment of climate change?" We take on a challenge to answer this question by integrating state-of-the-art data collection and AI-based methods.

Forests are the largest terrestrial sinks for carbon and some of the richest biological areas on Earth. Climate change is, however, affecting forests through increasing temperatures, changing precipitation patterns and the growing number of biotic and abiotic disturbances [1]. Saving forest ecosystems is thus one of the key measures to mitigate climate change and save biodiversity. To maintain and improve forest biodiversity and forest resilience to climate change, updated forest policies and forest management strategies are being developed and implemented in adaptive forest management. They all require up-to-date data of the forest conditions including the vitality and health of trees, as well as the ongoing tree growth (i.e., carbon sequestration).

Initially, tree and forest growth have been assessed mainly for economic reasons in order to build forest yield tables as simple "growth models" and a basis for improved forest management and taxation. Only within the past 50 years, improved tree and forest growth models have become available (e.g., [2]). They do not, however, allow for consideration of instantaneous changes in growth due to climatic extremes (e.g., drought, heat) and the changes of phenological patterns (i.e., length vegetation season).

Tree circumference can be used to draw many conclusions about tree health and growth. In the course of the #AI4Trees project, researchers are now trying to better understand the natural processes behind this using artificial intelligence...see more

Laserscanningtechnologien liefern Punktwolken, aus denen Kenngrößen im Bestand abgeleitet werden können. © BFW

AI4TREES

Natürliche Intelligenz künstlich verstehen

Ein Artikel von Anita Zolles (BFW), Karl Gartner (BFW) | 28.10.2022 - 12:12

Über den Baumumfang können vielerlei Rückschlüsse auf Baumgesundheit und Wachstum gemacht werden. Im Zuge des FFG-geförderten Projekts AI4Trees versuchen Forschende nun, mittels künstlicher Intelligenz die natürlichen Vorgänge dahinter besser zu verstehen. Ziel ist neben der Untersuchung von Extremereignissen auch die Identifikation wichtiger Monitoringparameter.

Tree and forest characteristics have become the focus of research to assess intraday variation of tree radial growth (automatic characterisation of the tree and crown architecture including their vitality to assess tree health and vitality with airborne and satellite quantitative forest data, but their correct analysis and interpretation nowadays with the advanced probabilistic and machine learning methods).

Protection, Environment, Energy, Mobility, Innovation and Technology (BMK) has taken on the challenge of developing a predictive AI-based system for the optimal machine learning strategies. Multidisciplinary Institute of Technology GmbH (coordinator, AIT), Umweltdata GmbH (UWD), Know-Center GmbH (consortium partner) and GeoVilE GmbH (GeoVilE) and

Accesses

Tree Growth

Phenological Patterns Change

Single tree growth model Integrating climatic extremes and 3D image of the surroundings (middle), and dendrometer

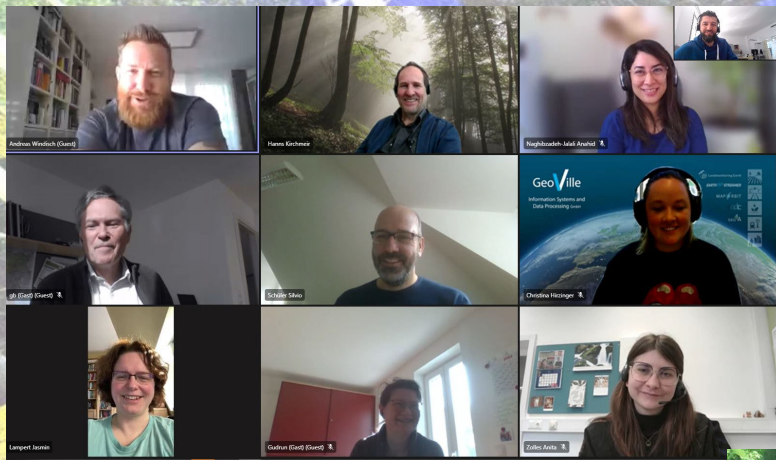
In-field data directly from forest sites selected from the Europe-wide vitality and adaptability of trees, nutrient cycles, critical for forest health. Data can be made about climate change, air pollution, biodiversity, and forest measurement sites, where for each site, there are 10

➤ (some) **Success points:**

- Deep understanding of the topic (Climate Change – Trees – Forestry – etc.) – due to great cooperation and exchange among the domain experts and tech partners
- Scientific progress on data collection and modelling
- Active dissemination activities reaching out to scientific and general public

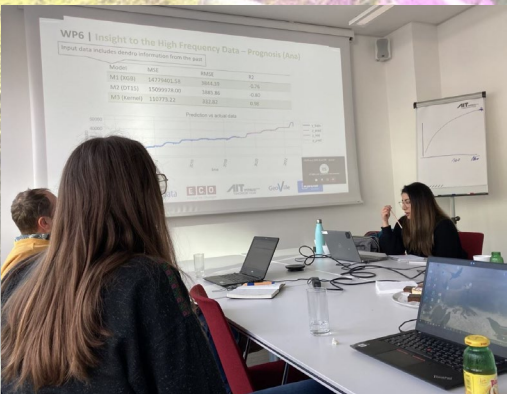
➤ (some) **Challenges:**

- Data collection in certain cases can be affected due to the external factors (e.g., weather conditions)
- Reevaluation of the project plan due to new findings in the course of the project



Thank You!

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 **FFG**
 Forschung wirkt.

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