VI ENCONTRO BRASILEIRO DE MENSURAÇÃO FLORESTAL
23 a 25 de agosto de 2023
Recife - PE
UNIVERSIDADE FEDERAL RURAL DE PERNAMBUCO

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

Ana Paula Dalla Corte

UFRPE CAPES CNPq FACEPE FUNDAÇÃO APOLÔNIO SALLES FADURPE CREA-PE Conselho Regional de Engenharia e Agronomia de Pernambuco

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

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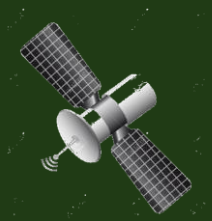
VI MENSUFLOR
UFRPE - 2023



AQUISIÇÃO DIRETA DE DADOS NA M.F.

AQUISIÇÃO INDIRETA NA M.F.

INVENTÁRIOS FLORESTAIS

SÍNTESE

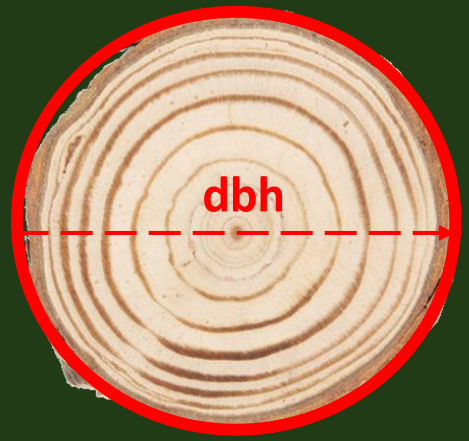
AQUISIÇÃO DIRETA

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

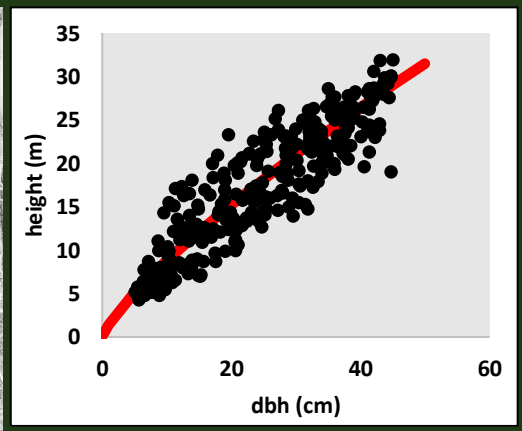
Ana Paula Dalla Corte

Forest Mensuration is the determination of dimensions, form, weight, growth, volume, and age of trees, individually or collectively, and of the dimensions of their products (Husch et al. 2002)

MEDIÇÃO DIRETA



MEDIÇÃO INDIRETA



AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

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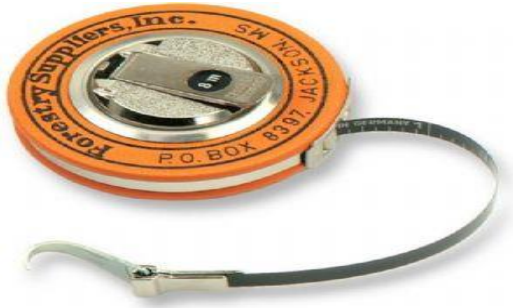
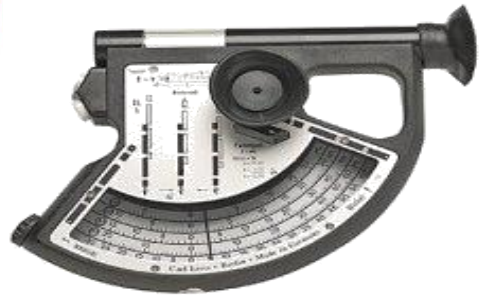
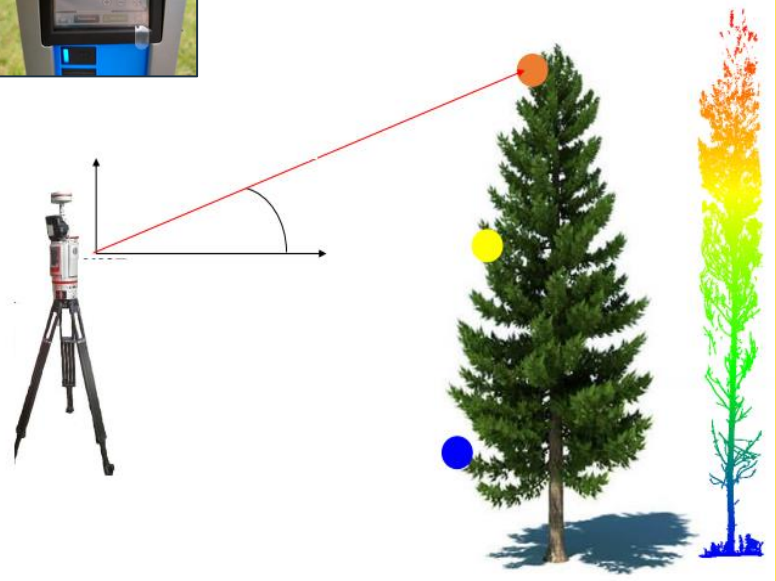




MAIS RECENTES...

Instrumentos eletrônicos, vinculando seu uso ao computador



TRADICIONAIS...

Instrumentos baseados principalmente em abordagens mecânicas ou óticas

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

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AQUISIÇÃO DIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

- Diâmetro
- Altura
- Volume
- Biomassa

AQUISIÇÃO DIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

Diâmetro

Fonte: Haglof (2023)

Fonte: Treevia (2023)

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

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AQUISIÇÃO DIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

Altura

Árvores baixas - régua graduada

Árvores abatidas

Estimada (Indireta)

Fonte: Haglof (2023)

AQUISIÇÃO DIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

Volume

Escalada

Cubagem

Estimada (Indireta)

AQUISIÇÃO DIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

Biomassa

AQUISIÇÃO INDIRETA

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AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

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ESCANEAMENTO TRIDIMENSIONAL

FOTOGRAMETRIA DIGITAL

SENSORES ORBITAIS

APP SMARTPHONE

VIDEOGRAFIA

VI MENSUFLOR
UFRPE - 2023

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

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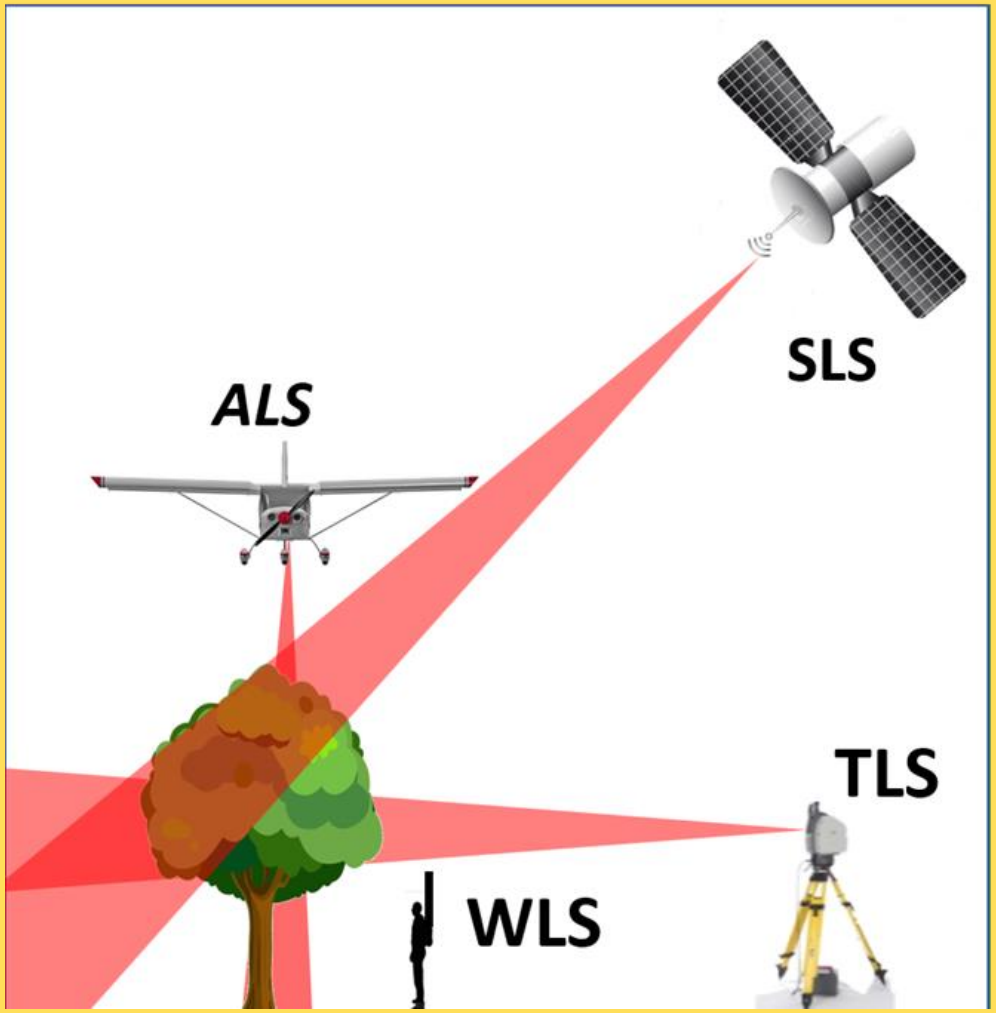
AQUISIÇÃO INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

ESCANEAMENTO TRIDIMENSIONAL – PLATAFORMAS DE AQUISIÇÃO



- PLATAFORMAS E SISTEMAS
  - Airborne Laser Scanning (ALS)
    - UAV-LiDAR
  - Terrestrial Laser Scanning (TLS)
  - Spaceborne Laser Scanning (SLS)
  - Mobile Laser Scanning (MLS) ou Wearable Laser Scanning (WLS)

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

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Aerial Laser Scanning (ALS)	Terrestrial Laser Scanning (TLS)
• Laser scanner acoplado em plataforma aérea • Inadequado para representação de vegetação de sub-bosque • Menor densidade de pulsos • Oclusão em certas situações do sub-bosque • Qualidade da representação diminui a medida que a densidade do sub-bosque aumenta	• Densidade de pontos muito superior (>1000pts/m²) • De fácil operação e com excelente precisão • Para os objetos próximos, excelente representação espacial (Alcance +- 100m)

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

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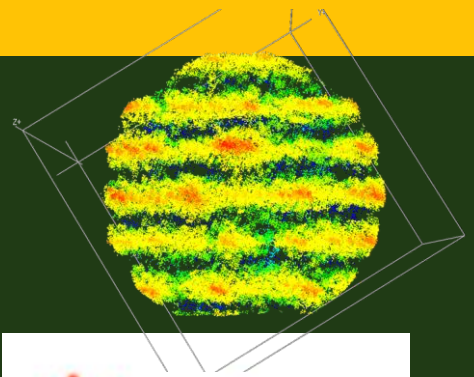
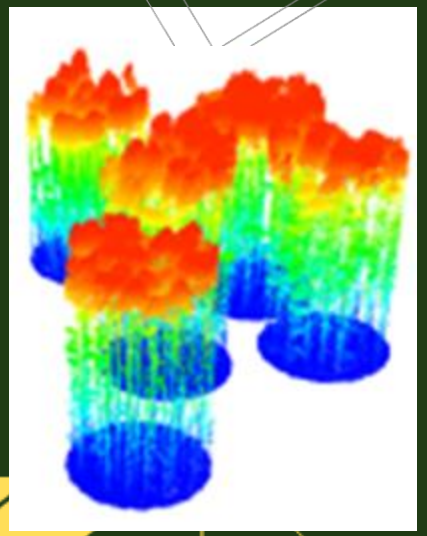
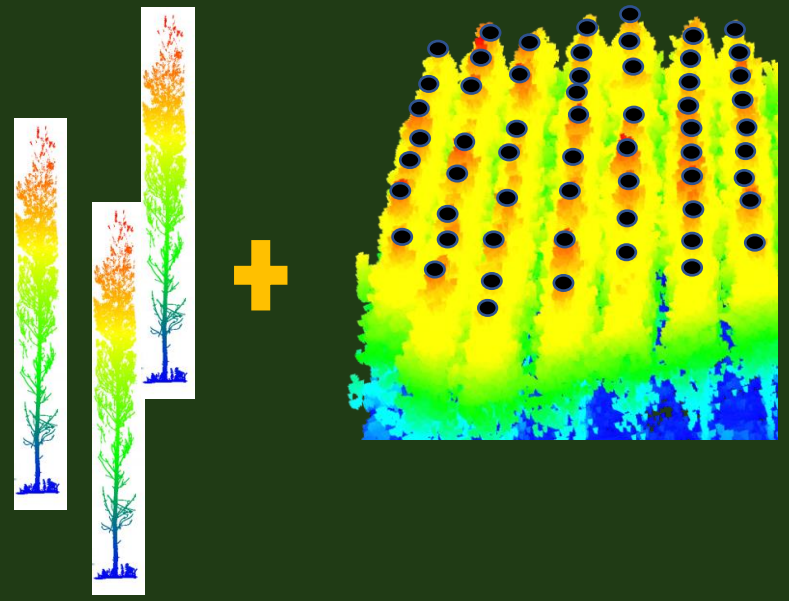
ABORDAGENS PARA INVENTÁRIO FLORESTAL

Inventário Florestal (IF)
Abordagem por Unidade de Área





Inventário Florestal (IF)
Abordagem por Árvore Individual



ESTIMATIVAS PARA A POPULAÇÃO

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

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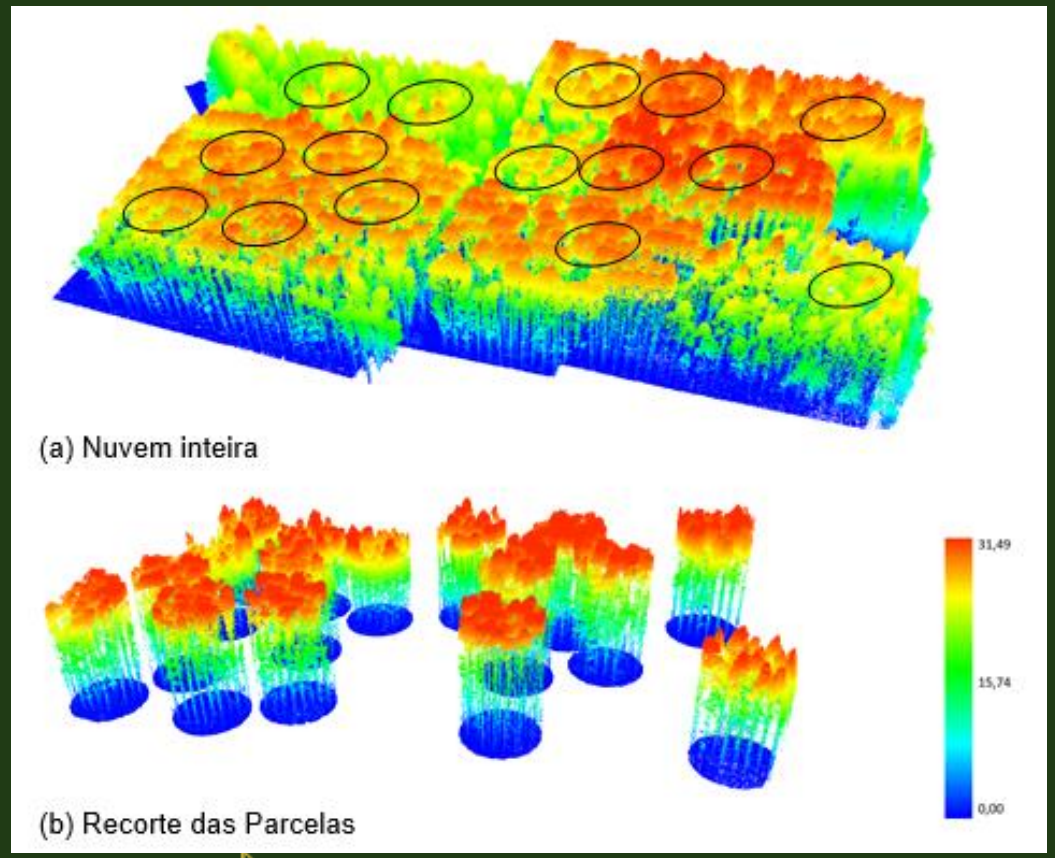
AQUISIÇÃO INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

ESCANEAMENTO TRIDIMENSIONAL - IF - Abordagem por Unidade de Área



Métricas	Correlação Pearson (r) Volume da parcela	Métricas	Correlação Pearson (r) Volume da parcela
Elev maximum	0,769	Elev P50	0,757
Elev mean	0,761	Elev P60	0,776
Elev mode	0,780	Elev P70	0,784
Elev stddev	0,744	Elev P75	0,826
Elev variance	0,767	Elev P80	0,852
Elev CV	0,600	Elev P90	0,890
Elev P30	0,670	Elev P95	0,880
Elev P40	0,736	Elev P99	0,879

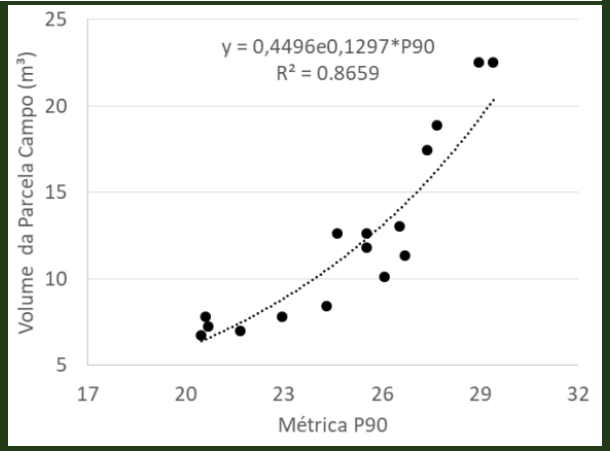
Observação: em cinza, destacado está a métrica selecionada para o desenvolvimento do modelo de volume.

Métricas:

- CV
- P5
- P25
- P50
- P75
- P90
- P95
- Std...

Regressão I.A.

- Biomassa
- Área Basal
- Volume
- Material combustível



Sanquetta et al. (2023).
Inventários florestais: planejamento e execução. 4ª edição.

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

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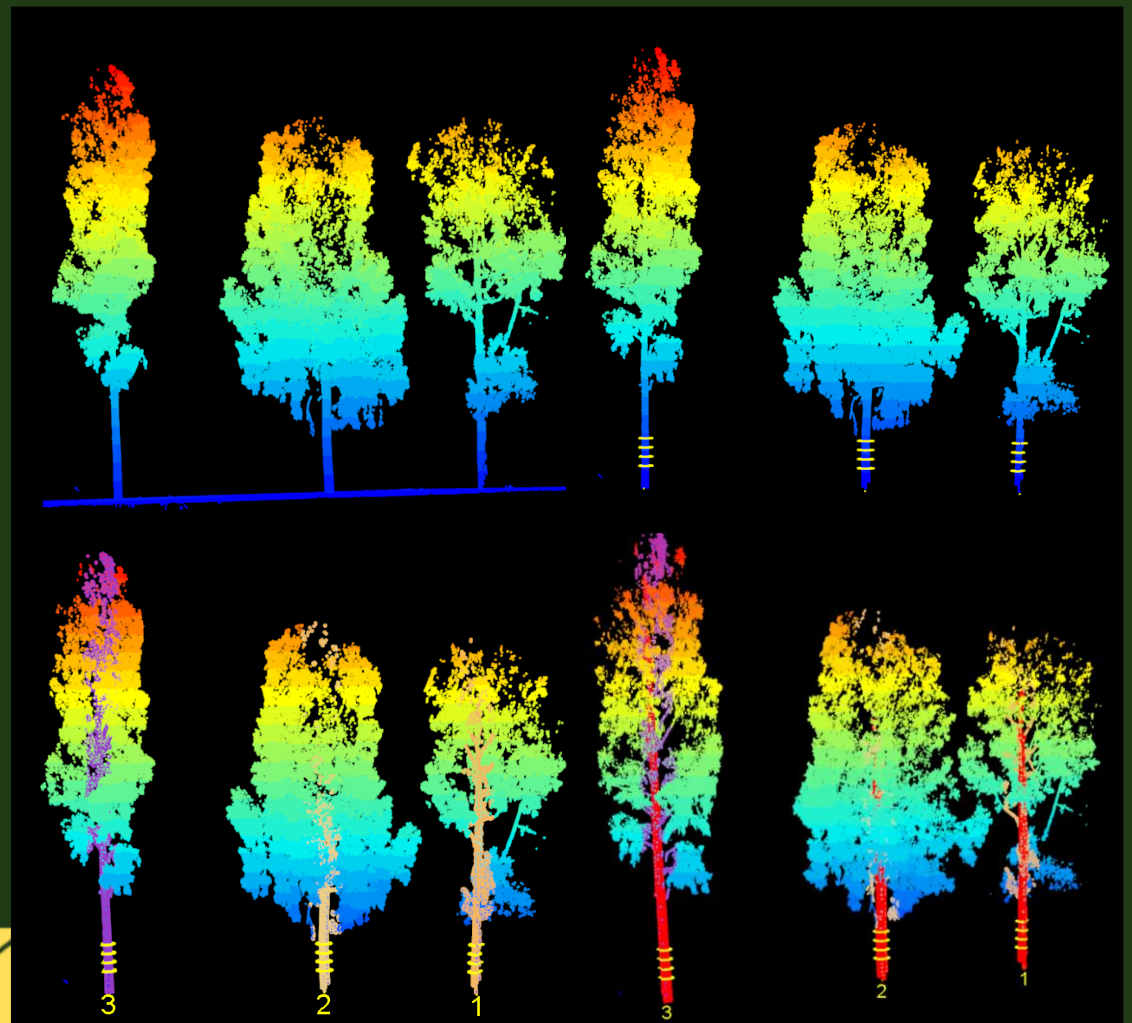
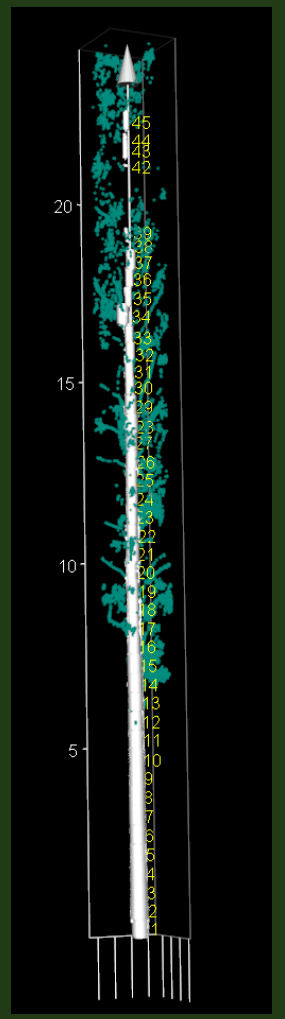
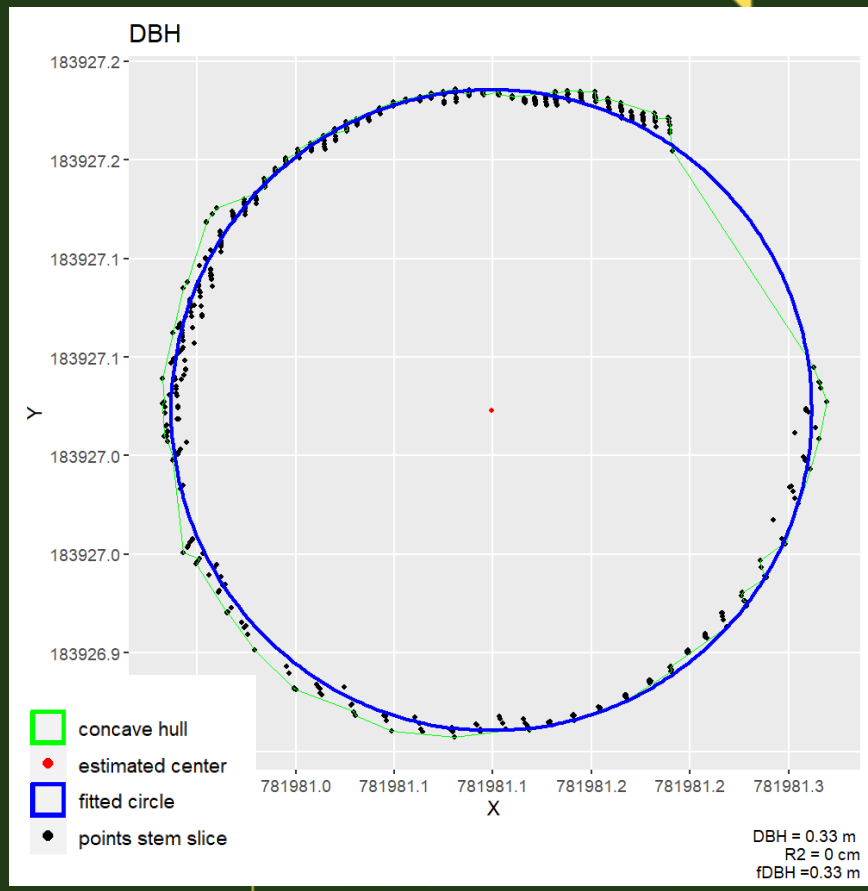
AQUISIÇÃO INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

ESCANEAMENTO TRIDIMENSIONAL - IF - Abordagem da árvore individual







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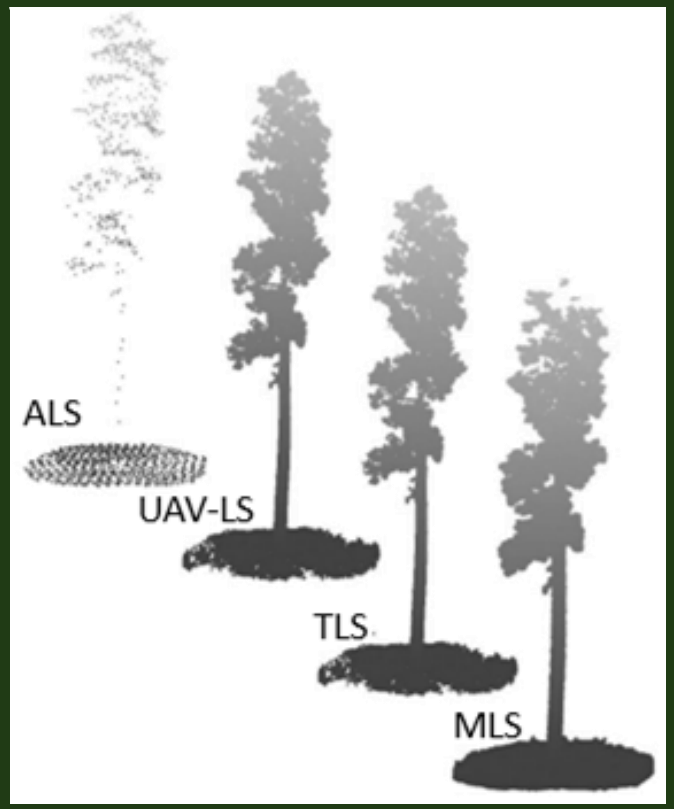
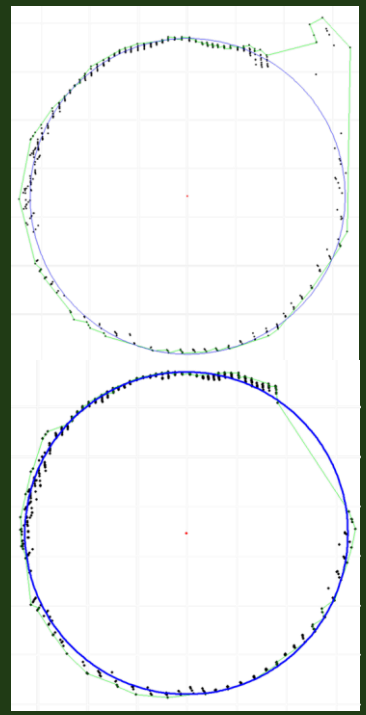
AQUISIÇÃO INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

ESCANEAMENTO TRIDIMENSIONAL - IF - Abordagem da árvore individual





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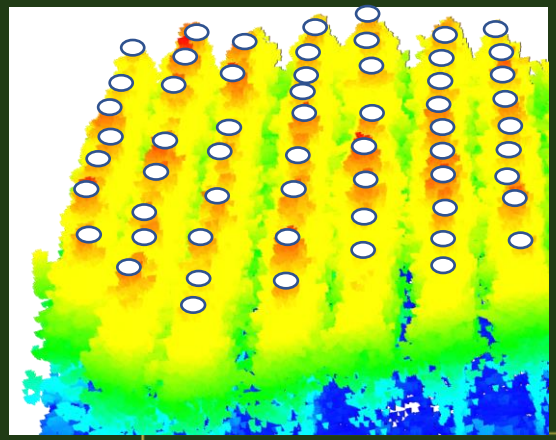

Sanquetta et al. (2023).
Inventários florestais: planejamento e execução. 4ª edição.

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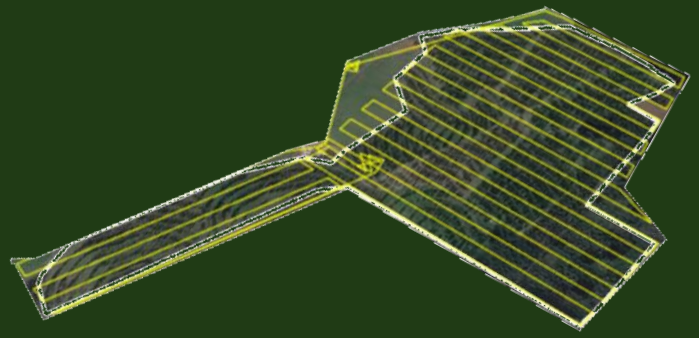
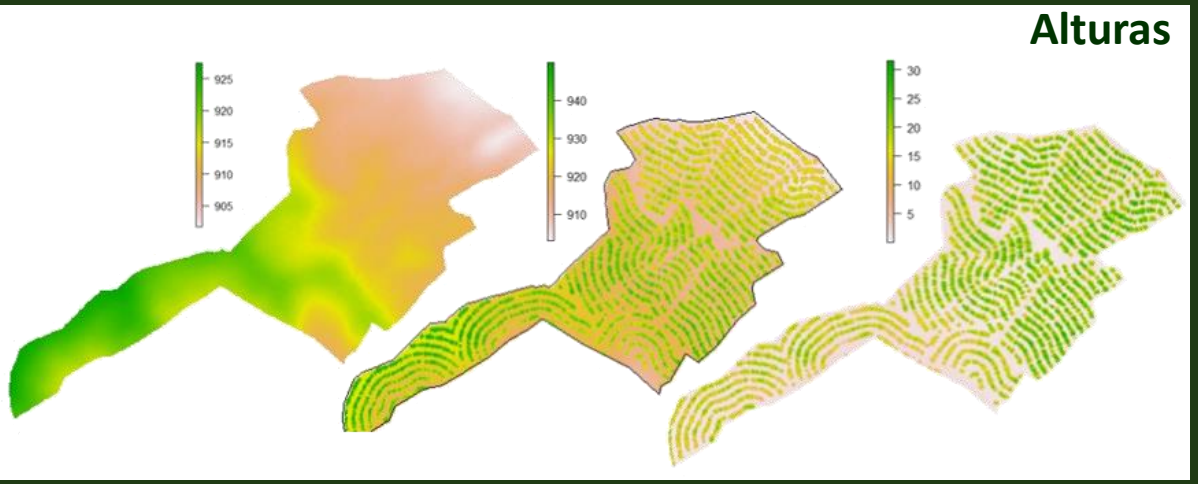
AQUISIÇÃO INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

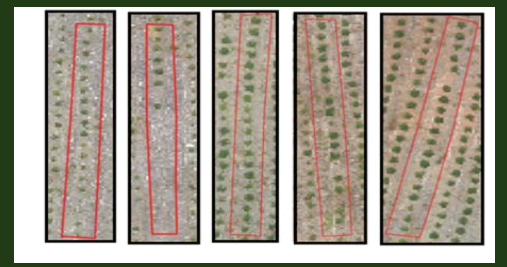
FOTOGRAMETRIA DIGITAL - Aérea

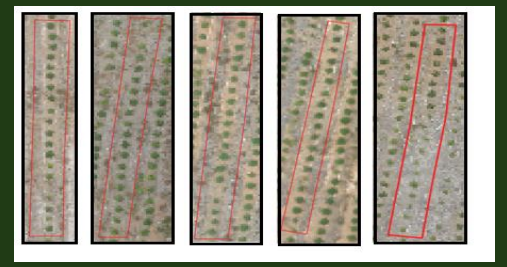


Alturas



Sobrevivência





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AQUISIÇÃO INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

FOTOGRAMETRIA DIGITAL - Aérea

- Mapeamentos de espécies comerciais do dossel
- Fenofases de espécies (Embrapa Acre desenv. pesquisas)
  - ➢ floração e ausências das folhas

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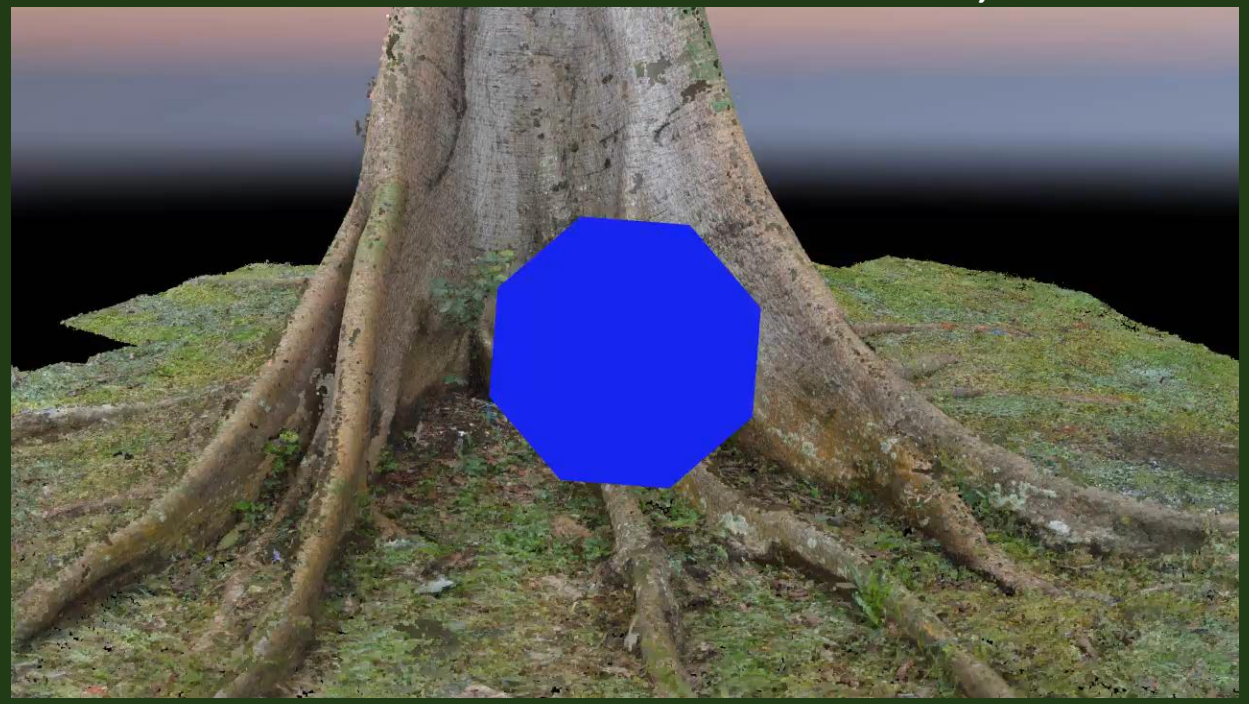
AQUISIÇÃO INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

FOTOGRAMETRIA DIGITAL - Terrestre

Noël Decourt fotografia para áreas basais 1956 (em francês)

Local: Acre

Sumauma → **5,0 m³**



Fonte: Veras, 2021

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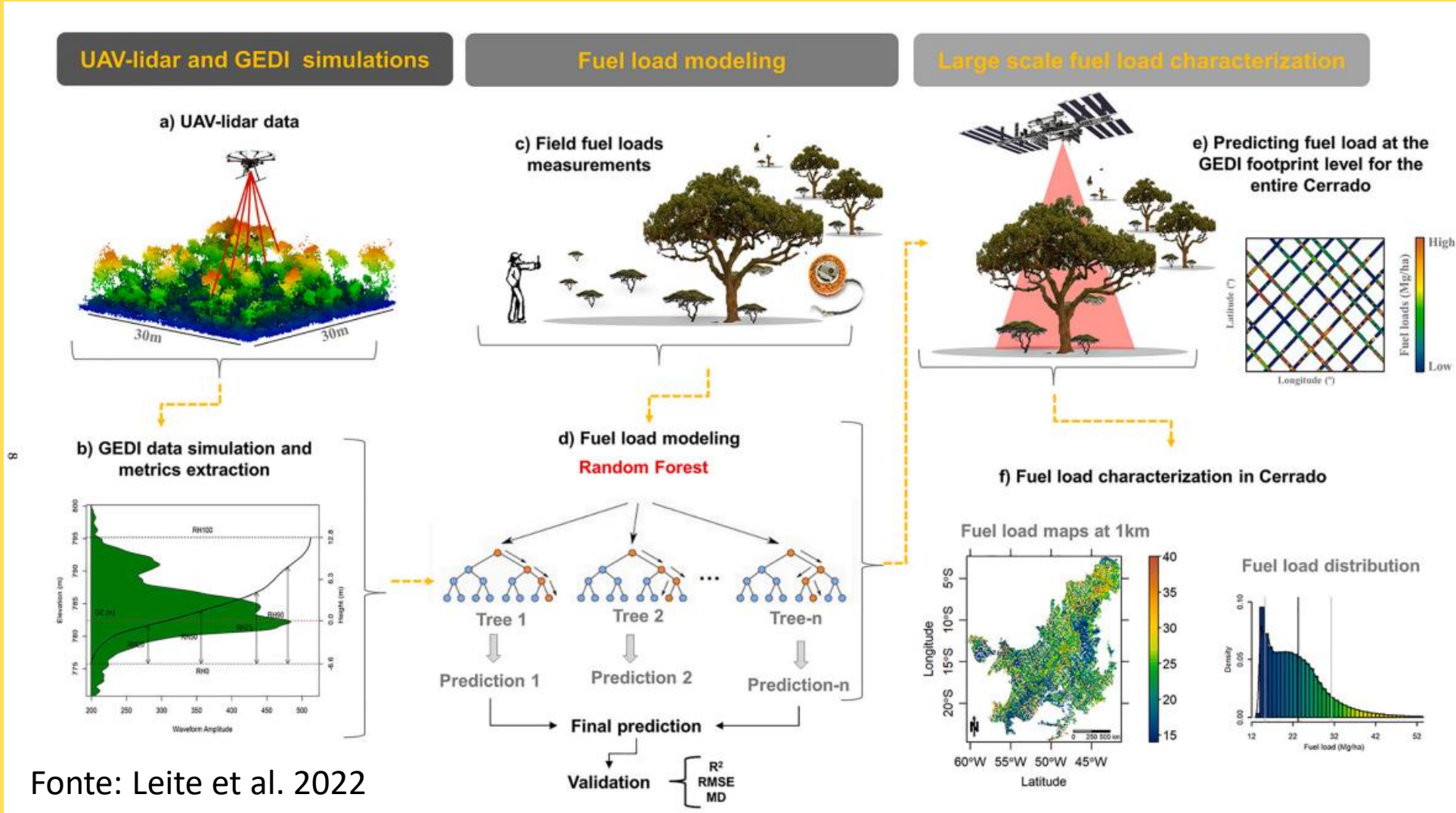
AQUISIÇÃO INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

Global Ecosystem Dynamics Investigation (GEDI)



Fonte: Leite et al. 2022

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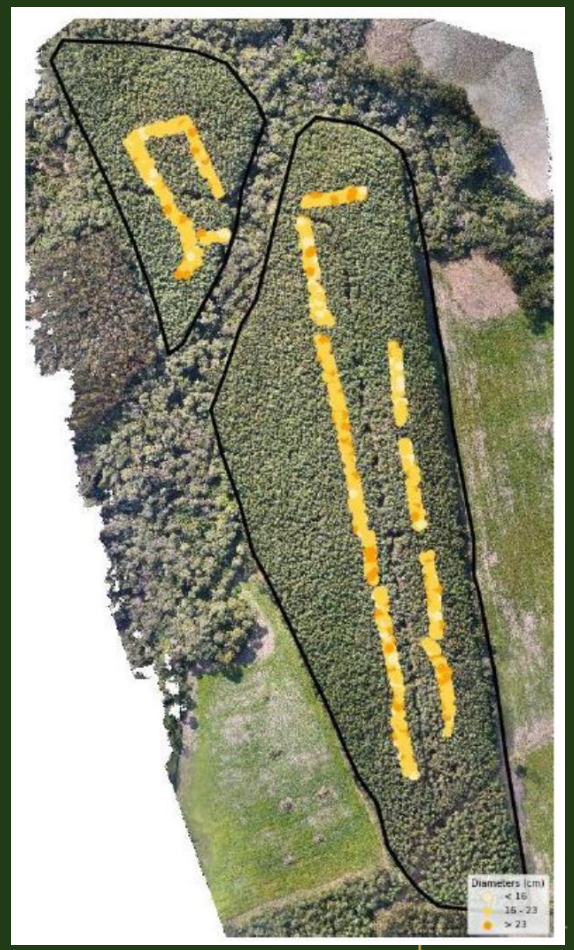
AQUISIÇÃO INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

VIDEOGRAFIA - KATAM™ Forest Engine

Aplicativo de smartphone
Vídeos de 60 a 90 segundos com caminhamentos em linha
GoPro, Drones e Lidar podem ser incorporados



Fonte: Sanquetta et al. 2023

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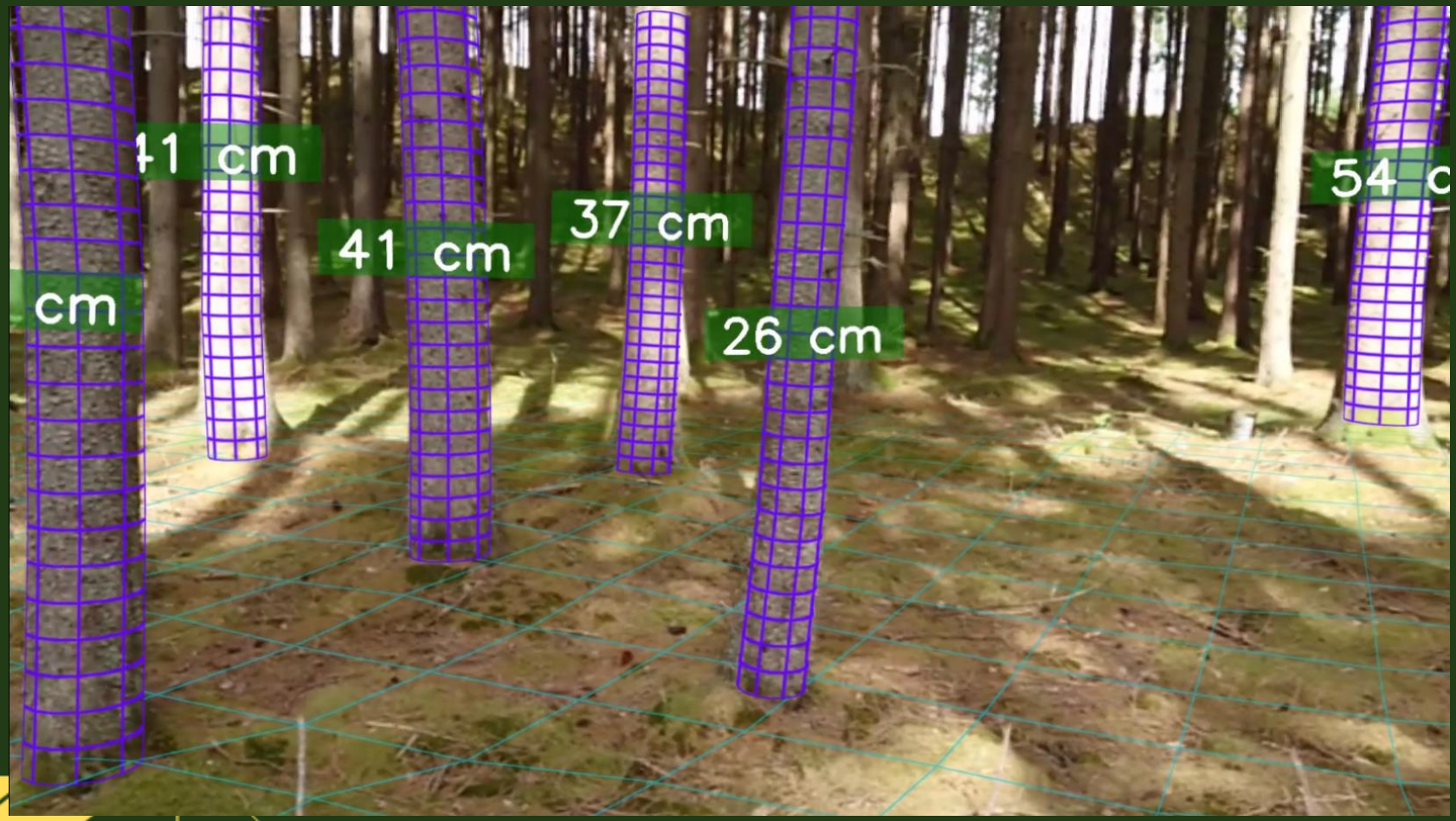
VIDEOGRAFIA - KATAM™ Forest Engine



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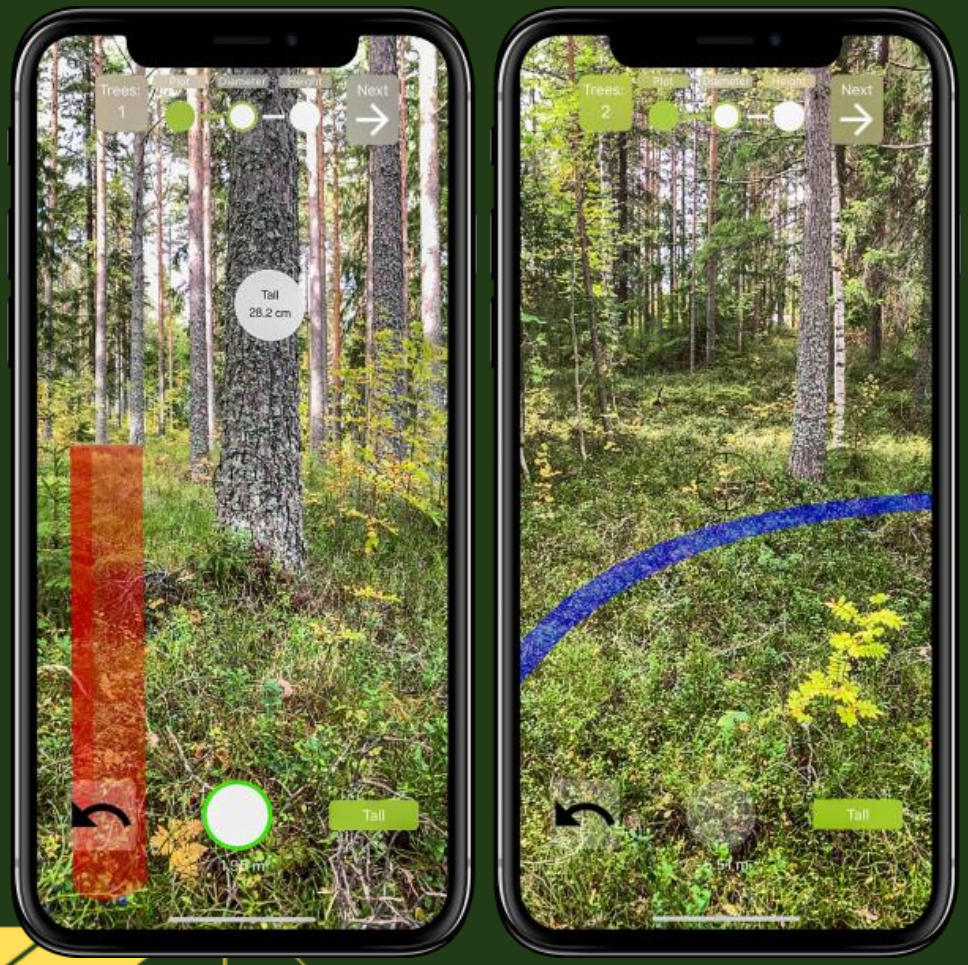
AQUISIÇÃO INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

APP SMARTPHONE



Fonte: Arboreal, 2023

Fonte: Vastaranta et al. 2015

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

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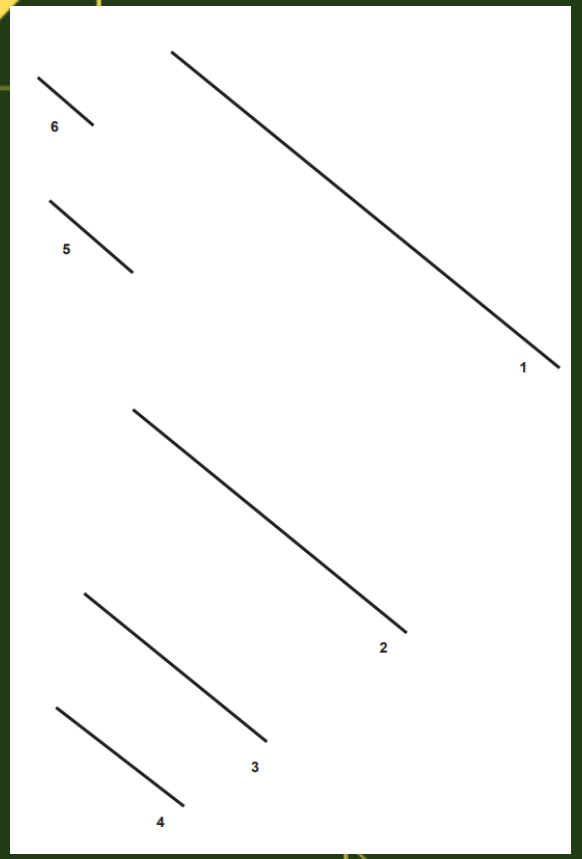
APP SMARTPHONE



- Área basal
- Nº de árvores
- Altura
- Volume

GESTION

Les smartphones au service de la forêt

par Olivier Noiret
Expertise et gestion forestière

Fonte: Arboreal, 2023

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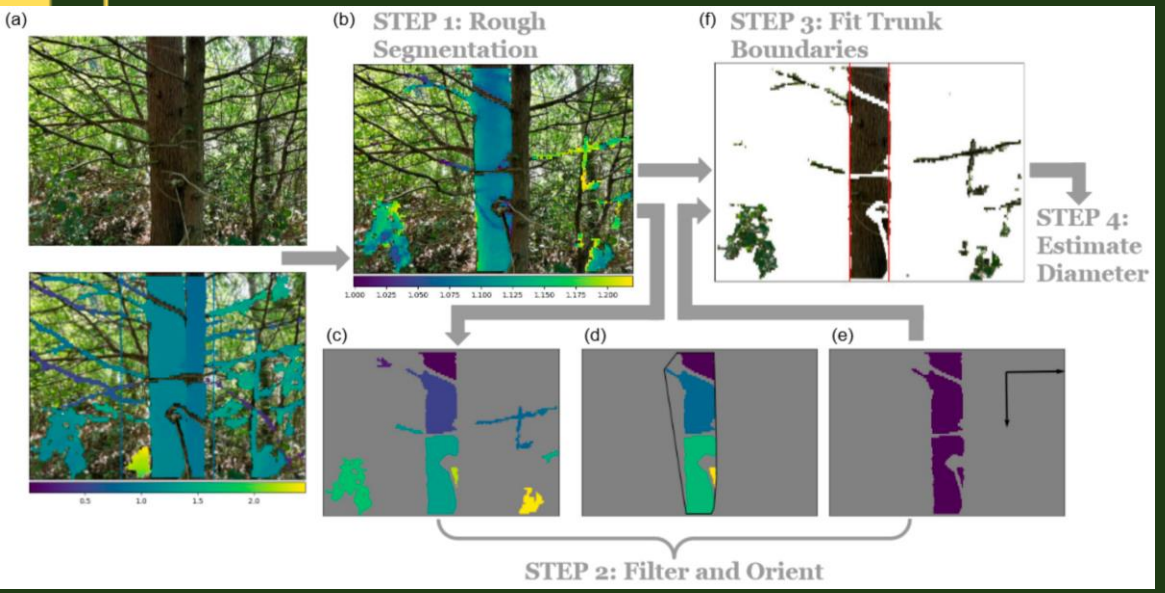
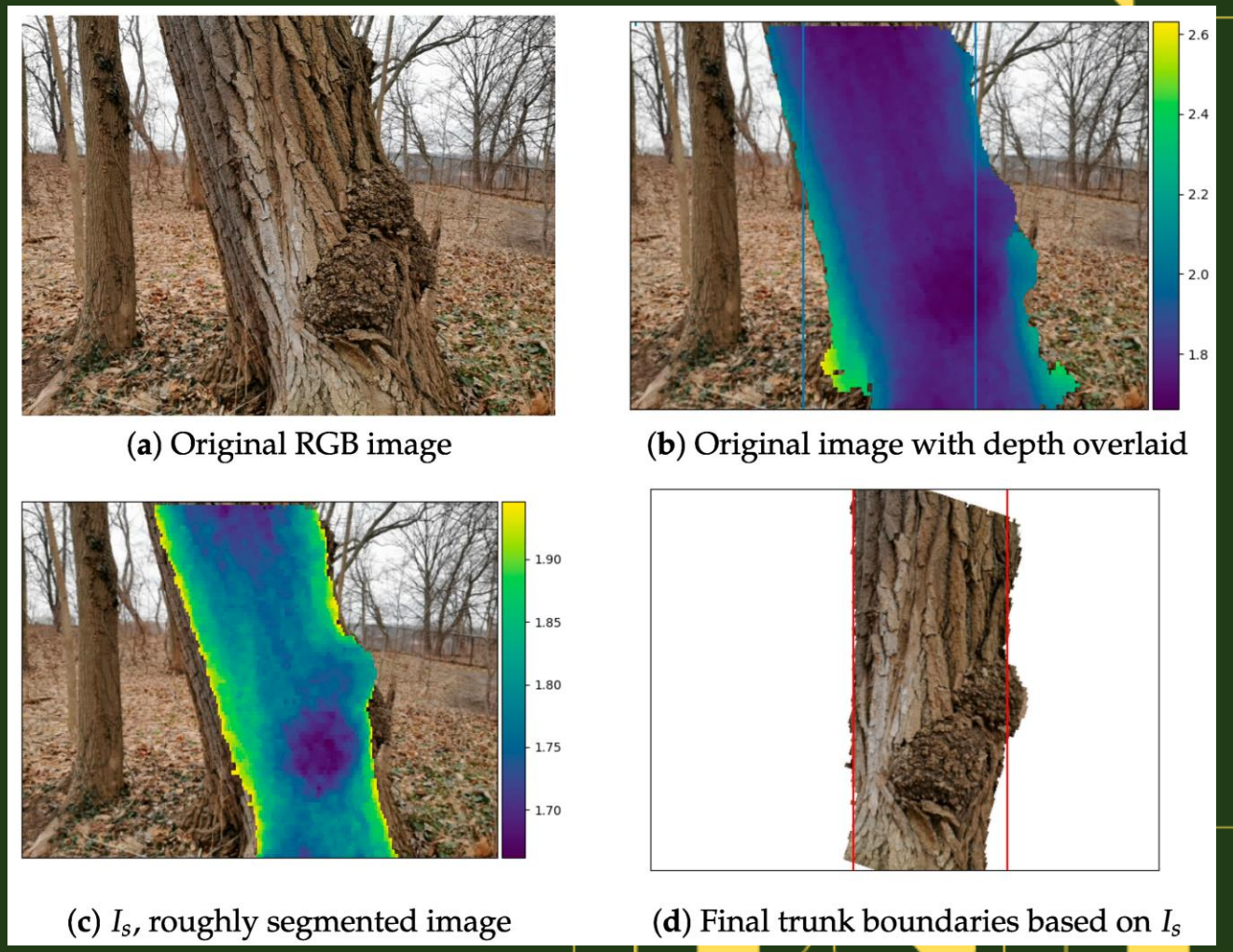
APP SMARTPHONE



Fonte: Holcomb et al. 2023



(a) Original RGB image

(b) Original image with depth overlaid

(c) I_s, roughly segmented image

(d) Final trunk boundaries based on I_s

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

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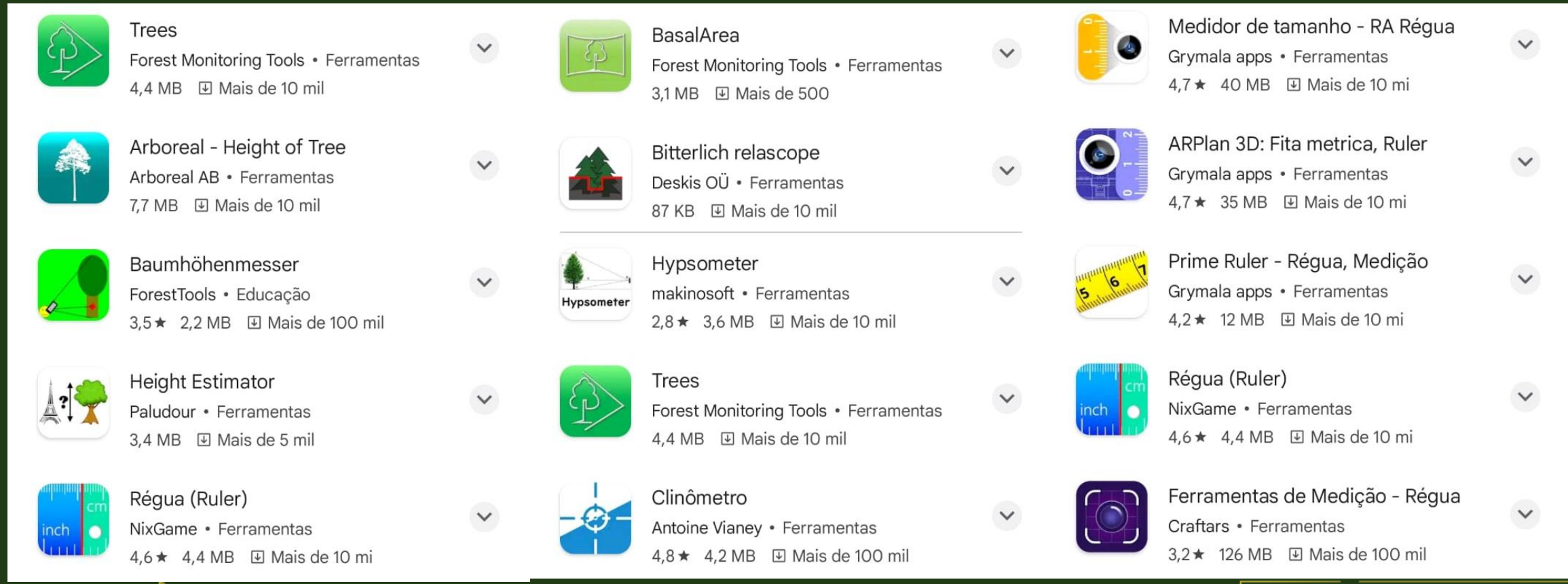
AQUISIÇÃO INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

APP SMARTPHONE



Fonte: PLAY STORE

INVENTÁRIO FLORESTAL

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

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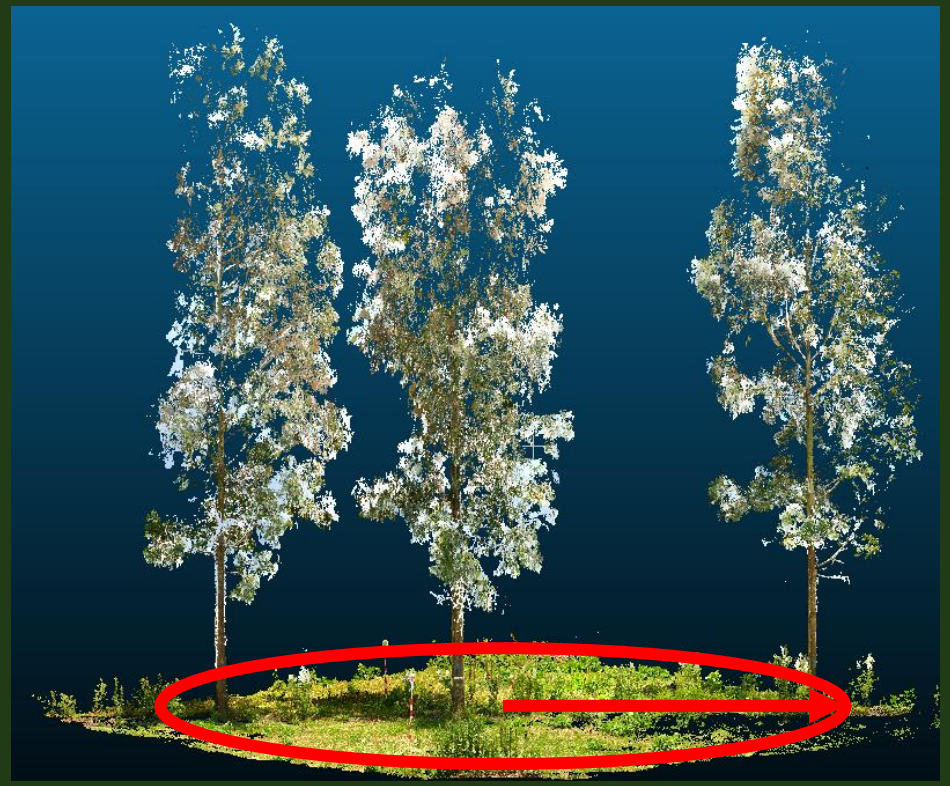
TENDÊNCIAS PARA INVENTÁRIO FLORESTAL



COMPUTADOR

Electronic instruments that are typically linked to a computer software

CAMPO

Instruments based mostly on mechanical or optical approaches

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

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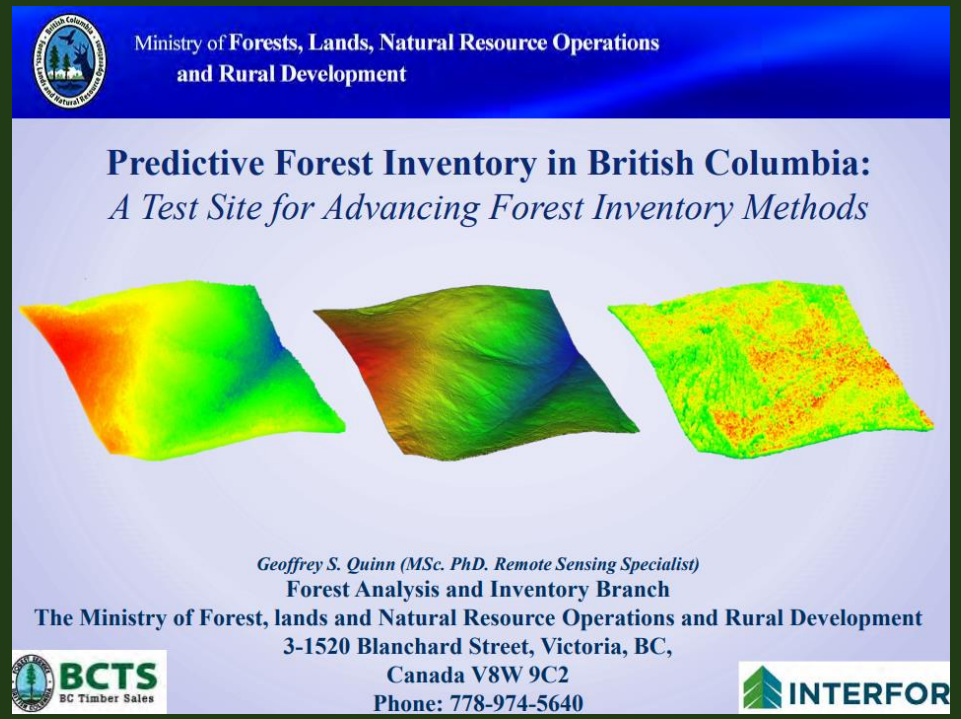
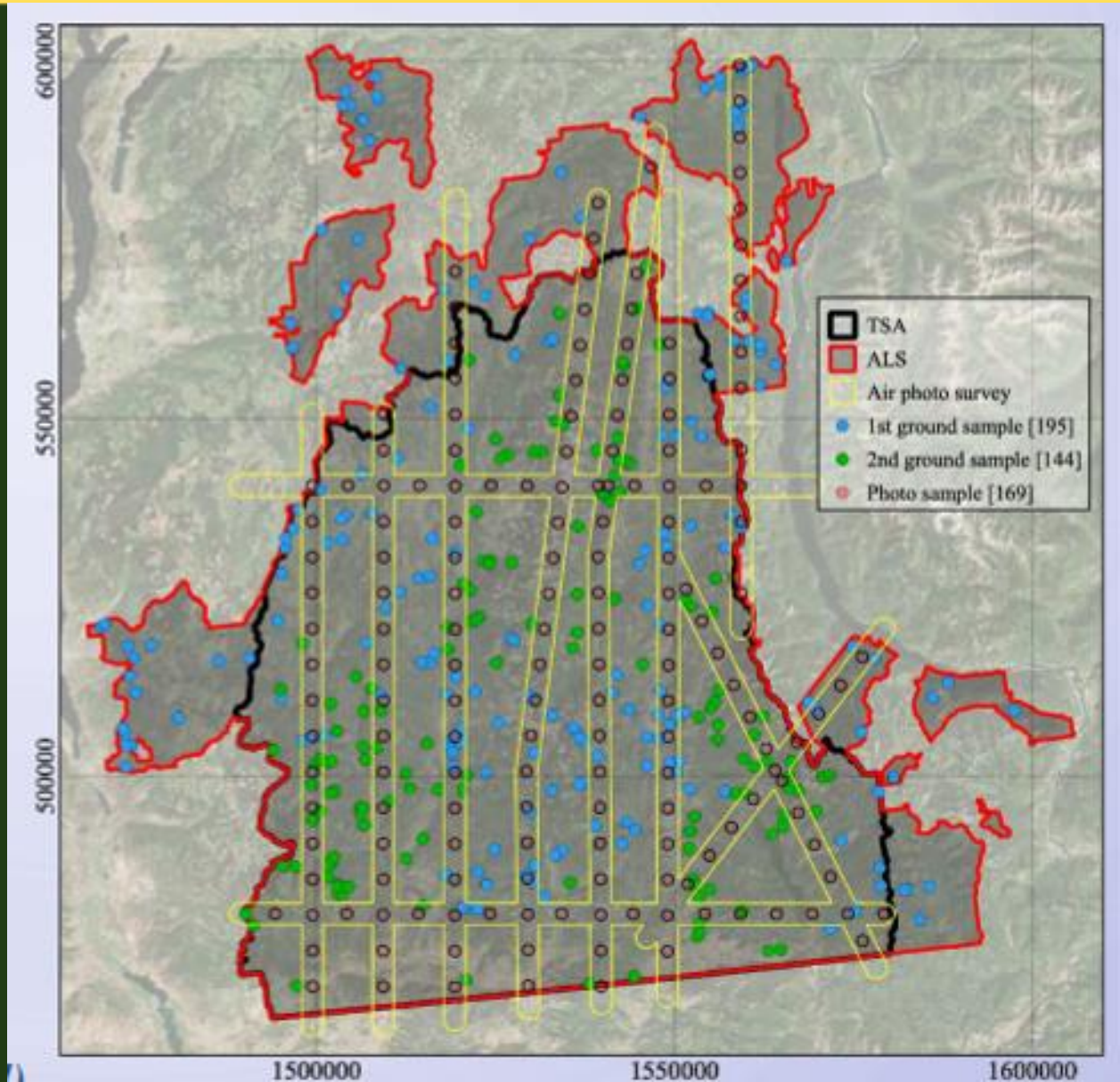


Objetivos:

- Desenvolver novo padrão de inventário florestal
- Melhoria espacial e temática em relação ao tradicional
- Integração de dados para sinergias de informação



Fonte: BC, 2023

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

Ana Paula Dalla Corte

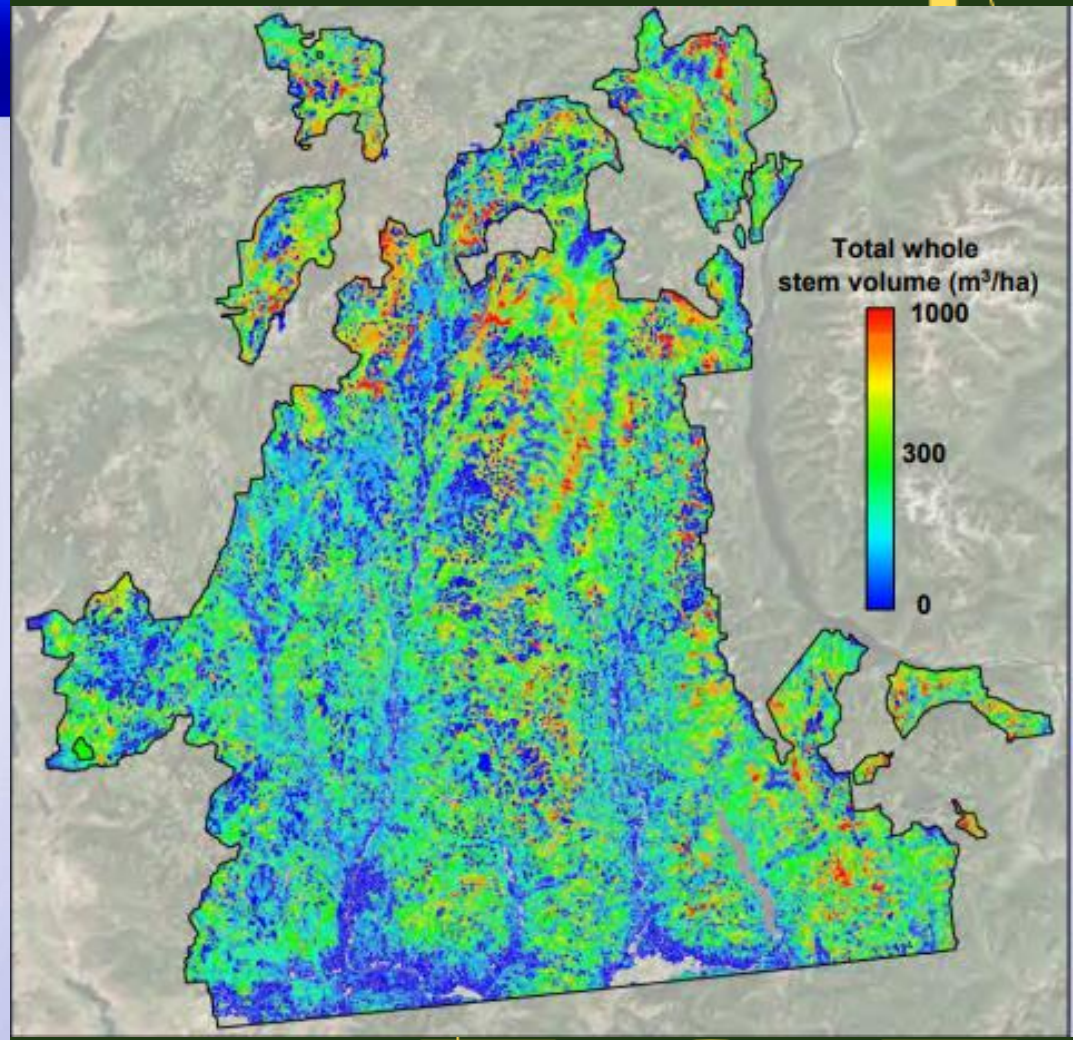
Ministry of **Forests, Lands, Natural Resource Operations and Rural Development**

Boundary TSA: *Predictive Forest Inventory*

Summary

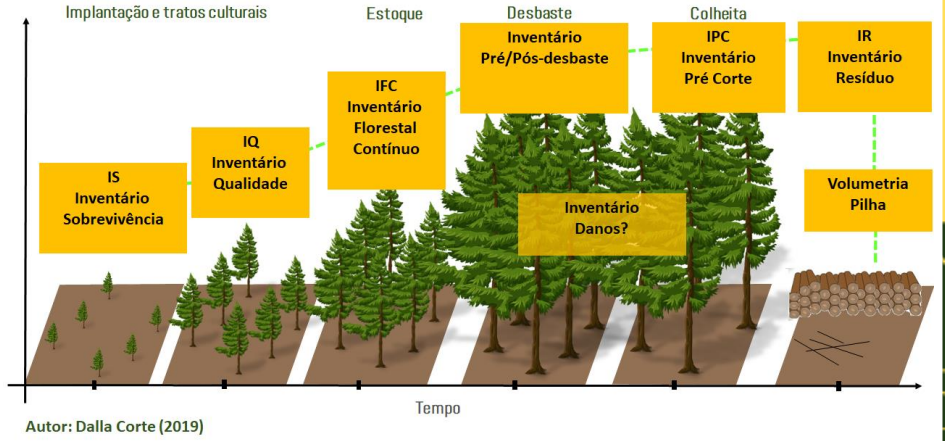
- PFI is a new approach to forest inventory
  - more accurate than current inventory (most attributes)
  - more spatially precise (smaller segments, 20m prediction, tree level)
  - objective statistical derivation
- PFI-2 experiment will test the spatial extrapolation of PFI-1
  - if successful less investment in data acquisition costs
- Lessons learned:
  - Processing all data at once is a significant time benefit
  - maintain redundancy into ground sampling survey procedure
  - Climate data may not significantly contribute to PFI-1
  - small benefit for stratification & merging live and dead
  - large diameter Cw problematic in BA and QMD modelling
  - TT metrics were important in density based models

Fonte: BC, 2023



INVENTÁRIO FLORESTAL

- *Melhoria na resolução espacial/temporal*
- *Disponibilização de imagens gratuitas*
- *Sensores para VANTs (área pequenas)*
- *Plataformas de processamento em nuvem*
- *Rotinas e códigos abertos*
- *Interfaces TR para informações*



Autor: Dalla Corte (2019)

- *Restrito em área*
- *Apoio em fases iniciais*
- *Agilidade na coleta*
- *Situações especificas*

- *Aprimoramento de algoritmos de IA*
- *Compreensão/estratificação Big Data*
- *Variáveis espaciais consideradas*
- *Agilidade no tratamento dos dados*
- *Rotinas e códigos abertos*
- *Alimentação continua*

- *Intenso e dispendioso*
- *Equipamentos com mesmos princípios*
- *Coletores com processamento inicial*
- *Medições TR continuas*
- *Testemunha*

- *Desenvolvimento sensores*
- *Reconstituição 3D*
- *Outras informações do terreno*
- *Difusão conhecimento*
- *Rotinas e códigos abertos*

ANA PAULA DALLA CORTE - UFPR

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

Ana Paula Dalla Corte

SÍNTESE FINAL

- Aquisição direta não vai DESAPARECER! Possivelmente irá diminuir a intensidade amostral.
- Diversas técnicas para aquisição indireta disponíveis. Diferentes níveis de maturidade tecnológica.
- Várias soluções desenvolvidas para outras realidades florestais. Algumas já em processo de adaptação às condições Brasileiras (principalmente para os plantios florestais).
- Floresta perfilada não significação necessariamente boas estimativas. É preciso saber tratar os dados e avaliar seu "output".
- O tema de representação 3D da floresta está sendo discutido em muitos fóruns internacionais de mensuração florestal. Precisamos incorporar tema no ensino, pesquisa e extensão.

Interessados chamar no WhatsApp:
(41) 99207-8869
(41) 99184-8567

UNIVERSIDADE FEDERAL DO PARANÁ

Ana Paula Dalla Corte, E-mail: anacorte@ufpr.br

AQUISIÇÃO DIRETA E INDIRETA DE DADOS NA MENSURAÇÃO FLORESTAL

Ana Paula Dalla Corte

MOTIVO DO TEMA...

VI MENSUFLOR
UFRPE - 2023

AQUISI ÃO FLORESTAL

DEVELOPING AN OPERATIONAL REMOTELY-SENSED FOREST INVENTORY ON STATE FORESTS IN OREGON

Sean McKenzie
ODF State Forest Division – Inventory Forester

Wednesday, December 14th 2022

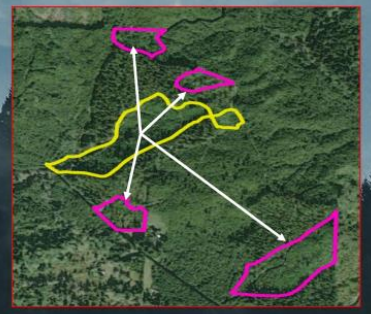
2nd Annual North American Forest Mensurationists' Conference – Portland, OR

OLD INVENTORY

STAND LEVEL INVENTORY

Double Sampling

Imputation

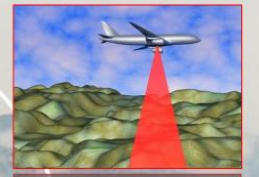


NEW INVENTORY

FIA
The Nation's Forest Census

FIELD PLOTS

Enhanced Forest Inventory



LIDAR

MULTISPECTRAL IMAGERY

2ND NORTH AMERICAN FOREST MENSURATIONISTS CONFERENCE – DEC 12 AGENDA DETAILS

MONDAY, DECEMBER 12, 2022 – AGENDA DETAILS

**The sessions in orange are student presentations.*

Click on any of the linked presentation titles below to view a PDF of that presentation.

Time	Room	Presentation Title	Speaker Name	Organization
8:00	1	Intro		
8:15	1	***Do Mensurationists Dream of Electric Trees?***	Mark Ducey	University of New Hampshire
9:00		*IUFRO introduction*		
9:15		Break (move to concurrent sessions)		
	1	*Room 1 Moderator (9:30am – 12pm)*	Catherine Bealle Statland	
	2	*Room 2 Moderator (9:30am – 12pm)*	Robert Froese	
9:30	1	*An inverse growth curve representation of the Clutter-Jones stand survival model*	Bronson Bullock	University of Georgia
	2	*Modeling the missing DBHs: Influence of model form on UAV DBH characterization*	Wade Tinkham	Rocky Mountain Research Station
	1	*A new framework to include environmental variables into G&Y systems*	Cristian Montes	University of Georgia
3:00		Break and posters		
3:30	1	*Impact of stumpage prices on optimal planting density and rotation age*	Benjamin Protzman	University of Georgia
	2	*Sequestering carbon through protection and production: A Case study of industrial reforestation in Mata Atlantica, Brazil*	Thomas Harris	Yale University
4:00	1	*Estimating tree utilization factors among product classes and species groups in the southern US*	Dinuka Madhushan Senevirathne	University of Tennessee
	2	*Evaluating whole-stand growth and yield models accounting for mid-rotation competing vegetation in loblolly pine plantations in the southern US*	John Young	University of Georgia
4:30	1	*Individual tree topographical position classification using LiDAR*	Oscar Raigosa-Garcia	North Carolina State University
	2	*A growth and yield system for slash pine including responses to silvicultural treatments*	Laura Ramirez Quintero	University of Georgia
5:30		Social		

9:15	1	*Assessment of understory vegetation in a plantation forest using Laser Scanning*	Angel Adhikari	University of Georgia
	2	*Detection and Mapping Red Pine Seedlings using UAV Imagery and Field Data*	Abishek Poudel	SUNY College of Environmental Science and Forestry
9:45	1	*Performance of BLK2GO on varying density pine stands*	Bini Dahal	North Carolina State University
	2	*Comparing Automatic Segmented Tree Crowns with Geometric Crown Models*	Andreas Tockner	University of Natural Resources and Life Sciences, Vienna
10:15	1	*Exploring alternative methodology to estimate by-species sawlog volume in the southeastern United States*	Tara Skiba	University of Tennessee
	2	*Red spruce stem taper in southern Appalachia*	Steve Morrone	Virginia Tech
11:00	1	*Predicting forest aboveground biomass with remotely-sensed and ground-based variables for mixed-hardwood forests in eastern Tennessee*	Sakar Jha	University of Tennessee, Knoxville
	2	*Comparing direct and indirect methods for estimating tree biomass change using forest inventory and aerial laser scanner data*	Suveksha Jha	University of Georgia

1:30	1	*Tree stem volume estimation from terrestrial LiDAR point cloud by unwrapping*	Robert Froese	University of Alberta
2:00	1	*Inclusion of tree age as an additional variable in volume equations improved taper and volume estimations for durango pine in Mexico*	Geronimo Quiñonez-Barraza	Instituto Nacional de Investigaciones Forestales Agícolas y Pecuarias
2:30	1	*Systems of equations in forest modeling: Classification and estimation*	Dehai Zhao	University of Georgia
3:00		Break		
3:15	1	*Modeling basal area yield using simultaneous equations system incorporating uncertainty estimators*	Cristian Montes	University of Georgia
3:45	1	*Developing an operational remotely-sensed forest inventory on state forests in Oregon*	Sean McKenzie	Oregon Dept. of Forestry
4:15	1	*Lessons learned from a Montana carbon inventory*	Zane Haxtema	Green Diamond

What is a Forest Mensurationist?
A forest mensurationist applies the science of measurement to quantify forest composition, structure and the goods and services forests provide. Grounded in geometry, sampling theory, statistics and ecology, a forest mensurationist describes the current status of trees. They also deal with measuring and predicting the growth of trees over time.

Mathematical and Computational Forestry & Natural-Resource Sciences Journal
MCFNS is a journal that provides a publishing platform for the forestry and natural resource sciences focused on theoretical derivations and simulations, discussions, reviews, and implementations of new mathematical and computer-based technologies. The journal shares a common platform with the Rationalist approach to research that is in contrast to the more mainstream Empiricist studies (statistical analysis of collected data) dominating the present natural resource sciences. mcfns.net

What's New

2023 Joint Meeting of SOMENS & NEMO
Oct. 8-10, 2023 – Knoxville, TN

SOMENS & NEMO
2023 Knoxville, TN

2023 JOINT MEETING OF SOUTHERN AND NORTHEASTERN MENSURATIONISTS

University of Tennessee, Knoxville from October 8 – 10

Keynote speaker: Greg Johnson

Presentation title: Are we missing the forest for the trees with Lidar?

About Greg: After receiving an MSc in Forest Biometrics from Oregon State University, Greg held a number of research, technical services, and biometrics positions at International Paper, Willamette Industries, and finally Weyerhaeuser. At Weyerhaeuser he capped his 40+ year career by forming and leading its Advanced Forestry Systems team, focused on Biometrics, Operations Research, Remote Sensing (including lidar), Statistics, and Wood Science. Greg and teams he led developed several growth models in use by the companies he worked for and participated directly in lidar-based inventory systems design and implementation.

The abstract for Greg's talk is:

Remote sensing has played a role in forest inventory for decades and that role is rapidly evolving. Our experience with it has ranged from disastrous failures to important achievements in cost reduction, accuracy improvement, and variance reduction. It is easy to imagine that these advancements will continue and perhaps accelerate. We are going to take a journey into the future and look at how remote sensing, and especially lidar and related technologies, will change how we think about forest inventory, the way we describe our forests, how we project their growth and development, and report standing and future products and conditions. Along the way, we will explore some technology and information gaps to be bridged on our journey (a jobs program for current and future mensurationists and biometricians!). Will stands exist? Will we have tree lists in our inventory databases? What will forest sampling mean? Will our existing permanent plot data be useful? Will we wake up from a bad dream or a bright new future? Get ready to suspend belief for a few minutes and explore

SOMENS & NEMO
2023 Knoxville, TN

Universi

2023 JOINT MEETING OF SOUTHERN AND NORTHEASTERN MENSURATIONISTS

Keynote speaker: Dr. John Paul McTague

Presentation title: Modern Methods of Estimating Tree and Log Volume, Part II

About Dr. McTague: Dr. McTague currently resides in Florida pursuing his interests in biometrics as Manager of Southern Cross Biometrics LLC and as adjunct faculty in Forest Biometrics at the University of Georgia and North Carolina State University. Dr. McTague's storied career started with a BS degree from SUNY-ESF, a MF degree in Forest Economics from Yale and a PhD in Forest Biometrics and Quantitative Forest Management from the University of Georgia. His professional career spans the continents of North and South America, where he has held managing/director positions for multiple multinational forest management firms. Dr. McTague also instructed at Northern Arizona University for twelve years; publishing growth and yield models for the ponderosa pine, mixed-conifer, and spruce-fir forest types.

The abstract for John's talk is:

Two major themes of the 1993 IUFRO Conference, entitled 'Modern Methods of Estimating Tree and Log Volume' are re-examined. Heavily focused on Importance Sampling, Control-Variate Sampling, and Centroid Sampling, several papers of 1993 Conference demonstrated how much a 3rd measurement (three-point system) can improve the estimate of volume. The Souter SE-282 taper model directly incorporates a 3rd measurement into the profile equation and displays yet further improvement for loblolly pine volume estimation. Returning to early solid of revolution derivations of Pressler and Hossfeldt, which directly incorporate stem form into the volume formula, further precision is attained. The second major theme of the 1993 IUFRO was directed to determining the optimal location of the 3rd or multiple upper-stem measurements. Jim Flewelling's additive adjustment to upper-stem predictions, based on one or multiple observed upper-stem measurements, is particularly relevant 30 years later with the availability of terrestrial LiDAR instruments. Finally, the presentation will examine how auxiliary information that is readily available during routine timber cruises, can be used to enhance volume estimation. The Southern Pine Volume and Weight Consortium collects sample trees from measured forest plots, thus affording the development of expressions for volume and taper that utilize the stand-level variables of age, relative spacing, thinning status, and tree ranking (dbh/dq).

Co-sponsored by the Western Mensurationists and the Forest Growth Organization of Western Canada.

Canmore, Alberta | June 18–21, 2023 | In Canada's Rocky Mountains

GROWTH AND YIELD INNOVATIONS CONFERENCE

June 18-21, 2023 Canmore, Alberta

Monday, June 19 – Day 1 Conf

Time	Ladyslipper Arnica	
8:00-8:30	**Introduction and Housekeeping** Katrina Froese	
8:30-9:30	**Keynote Address: Can we meet increasing demands for forest growth and yield information under increased scope, changing inventory technologies, and uncertain climate and disturbance regimes?** Dr. Valerie LeMay, RPF, Professor, Forest Biometrics and Forest Measurements, University of British Columbia	
9:30-10:00	**Tablet app for visualizing individual tree parameters with person-carried laser scanning (PLS) in forest inventory** Andreas Tockner, Dipl.-Ing., PhD Candidate, Institute of Forest Growth, University of Natural Resources and Life Sciences, Vienna	**Alternative subsampling designs derived from aerial and terrestrial remote sensing technology** Dr. John Kershaw, Professor, Forest Mensuration, University of New Brunswick
10:00-10:30	**Health Break**	
10:30-11:00	**Species identification from LiDAR** David Campbell, MScF, RPF, ForCorp Solutions Inc.	**Generalizing DBH and height prediction in coast Douglas-fir and red alder** Dr. Bogdan Strimbu, Associate Professor, Oregon State University
11:00-11:30	**Modeling aboveground carbon dynamics under different silvicultural treatments** Catherine Carlisle, Master of Forestry Candidate, Oregon State University	**Climate-sensitive mortality models in Ontario, Canada** Dr. José Riofrío, Department of Forest Resources Management, University of British Columbia
11:30-12:00	**Carbon budget of loblolly pine plantations in the southern US** Dr. Dehai Zhao, Senior Research Scientist, Warnell School of Forestry and Natural Resources, University of Georgia	**Census growth and yield models using only LiDAR and EFI data - no field data required** John Nash, Forest Ecologist, GreenLink Forestry Inc.
12:00-1:00	**Lunch and Group Photo**	
1:00-1:30	**5-Minute Lightning Talks *** - Noel Daugherty, U of Idaho - Surabhi Lukose, U of Alberta - Liam Gilson, U of BC - Dr. Mostarin Ara, U of Alberta - Yung-Han Hsu, U of New Brunswick - Christina Howard, U of BC - Benjamin Strelkov, U of Alberta - Dr. Sarita Bassil, U of Alberta	**Modelling tree-level western hemlock (*Tsuga heterophylla* (Raf.) Sarg.) responses to fertilization** Dr. Woongsoon Jang, Research Scientist, BC Ministry of Forests
1:30-2:00		**Tree list growth and yield models for planted loblolly pine** Dr. Corey Green, Assistant Professor of Forest Biometrics, Virginia Tech
2:00-2:30	**Why you should NOT use site index** Greg Johnson, Greg Johnson Biometrics LLC and Dave Hamlin, Mt. Hood Biometrics LLC	**Estimating changes in forest attributes with 3D remote sensing** Dr. Piotr Tompalski, Research Scientist, Pacific Forestry Centre, Canadian Forest Service
2:30-3:00	**Health Break**	
3:00-4:00	**Keynote Address: Incorporating regeneration dynamics and reforestation treatment effects into growth and yield models** Dr. Dick Dempster, Forest Growth Organization of Western Canada (Retired)	
4:00-4:30	**Day 1 Meeting Wrap Up** Katrina Froese	

une 20 – Day 2 Conference

	lipper Arnica	Orchid
	Keynote Address: A paradigm shift in empirical growth and yield modelling: towards climate-sensitive models and large area predictions Dr. Mathieu Fortin, Research Scientist, Canadian Wood Fibre Centre, Canadian Forest Service	
	Taper modeling for various genetic origins of Scots pine from Poland Dr. hab Karol Bronisz, Warsaw University of Life Sciences, Institute of Forest Sciences, Department of Forest Management Planning, Dendrometry and Forest Economics	**Growth response to pre-commercial thinning of lodgepole pine is short-term but the effects on size distribution persist for decades** Dr. Shes Kanta Bhandari, Postdoctoral Fellow, Department of Renewable Resources, University of Alberta
9:30-10:00	**Assessing uncertainty in k-most similar neighbor imputations for sustainable forest management: a conformal inference approach** Dr. Liviu Ene, Researcher, Value Chains Program, Forestry Research Institute of Sweden	**Application results of handheld mobile LiDAR study in Turkey** Ergin Çankaya, PhD Candidate, Forest Growth & Yield Lab, University of Alberta
10:00-10:30	**Health Break**	
10:30-11:00	**Ecological forecasting of forest biomass with tree-ring and forest inventory networks** Dr. Kelly Heilman, Postdoctoral Research Specialist, ORAU/USDA Forest Service	**A stand-level evaluation of FVS growth projections for a LiDAR forest inventory** Dr. Jacob Strunk, US Forest Service and Dr. Peter Gould, Mason Bruce & Girard
11:00-11:30	**Revisiting stand density development of loblolly pine plantations in western gulf region, USA** Dr. Yuhui Weng, Associate Professor, Stephen F. Austin State University	**Commercial thinning and nitrogen fertilization increase merchantability in lodgepole pine: 20-year result** Apsana Kafle, MSc Candidate, Department of Renewable Resources, University of Alberta
11:30-12:00	**The Tree and Stand Simulator (TASS): still providing understanding after 6 decades** Jeff Stone, Stand Development Modelling Research Scientist, British Columbia Ministry of Forests	**Using machine learning and contemporary computational statistical techniques to improve forest management decisions** Dr. Cristian Montes, Associate Professor, Warnell School of Forestry and Natural Resources, University of Georgia
12:00-1:15	**Lunch**	12:45 Western Mens Business Meeting
1:15-1:45	**Climatic sensitivities derived from tree rings improve predictions of the Forest Vegetation Simulator growth and yield model** Courtney Giebink, Oak Ridge Associated Universities; USDA Forest Service, Northern Research Station, Forest Inventory and Analysis	**Machine learning approaches for estimating forest stand height using airborne LiDAR data in New Brunswick forests** Elham Behroozi, PhD Candidate, Faculty of Forestry and Environmental Management, University of New Brunswick
1:45-2:15	**Stand structure classification and the indexing of diameter and height distributions** Dr. Ian S. Moss, RPF, Forest Inventory & Growth and Yield Consultant, Forestree Dynamics Ltd.	**Putting stereo glasses on data scientists: EFI to AVI** Kat Gunton, Senior Forest Analyst, Forsite Consultants Ltd.
2:15-2:45	**Health Break**	
2:45-3:45	**Keynote Address: The digital forest: opportunities for improved forest management through improved information** Dr. Rasmus Astrup, Head of Research, Division of Forest and Forest Resources, Norwegian Institute of Bioeconomy Research	
3:45-4:05	**Day 2 Meeting Wrap Up** Paul LeBlanc	
4:05-4:15	**Best Student Awards & Adjourn** Katrina Froese	

FBRI 2022 Annual Meeting

November 8, 2022 | Portland, OR | In-person & Streaming

***Click on any of the titles below to view the recording of that presentation.**

10:00	*Call to order and introduction of board, staff and audience members* – **Borchert**
10:20	*Welcome and overview of meeting* – **Borchert**
10:30	*Review of FBRI finances* – **Sharer**
11:00	*Tech support report* – **Purvis**
11:30	*Remote Sensing the Forest Inventory: Satellite Only vs. LiDAR Integrated* – **Halli Hemingway** (Virtual)
Noon	Lunch
1:00	*President's report* – **Opalach**
3:00	Meeting adjourns