

# Predicting Forest Growth Processes By Using Laserscanner Derived Stand Models and Simulating Sun Ecliptic

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# Introduction: Objective of the study

**Light is the most driving force for differentiation processes in forests.**



**Commonly used methods:**

- **allow only local data acquisition**
- **are carried out from the ground ↔ crown**
- **implicate time consuming field work**



**Approach to determine light reception of single trees by use of LIDAR data**

# Methods: Overview

**3D forest stand models:  
(DTM, DSM, polygons of delineated trees)**



**Sun position**

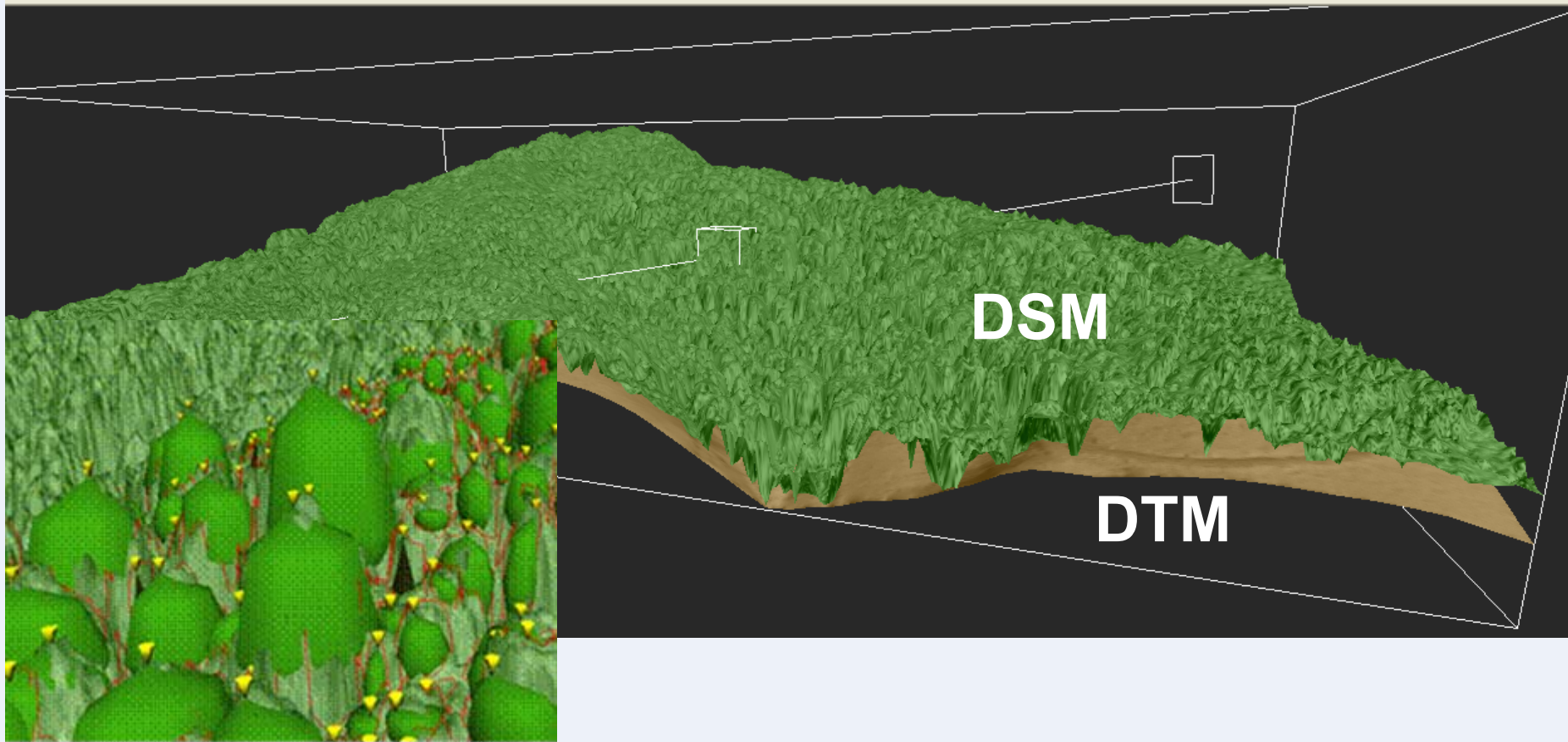


**Ray tracing**

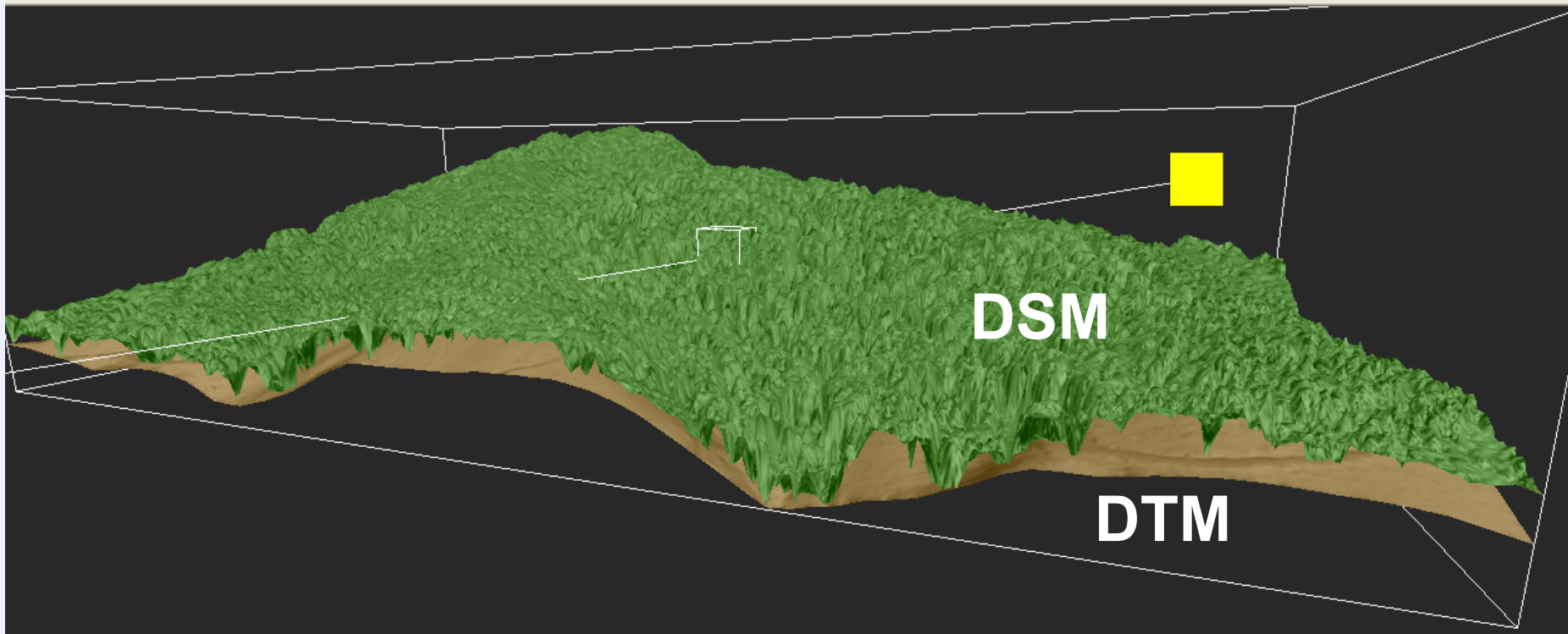


**Sun hits per m<sup>2</sup> crown surface**

# Methods: 3D forest stand models

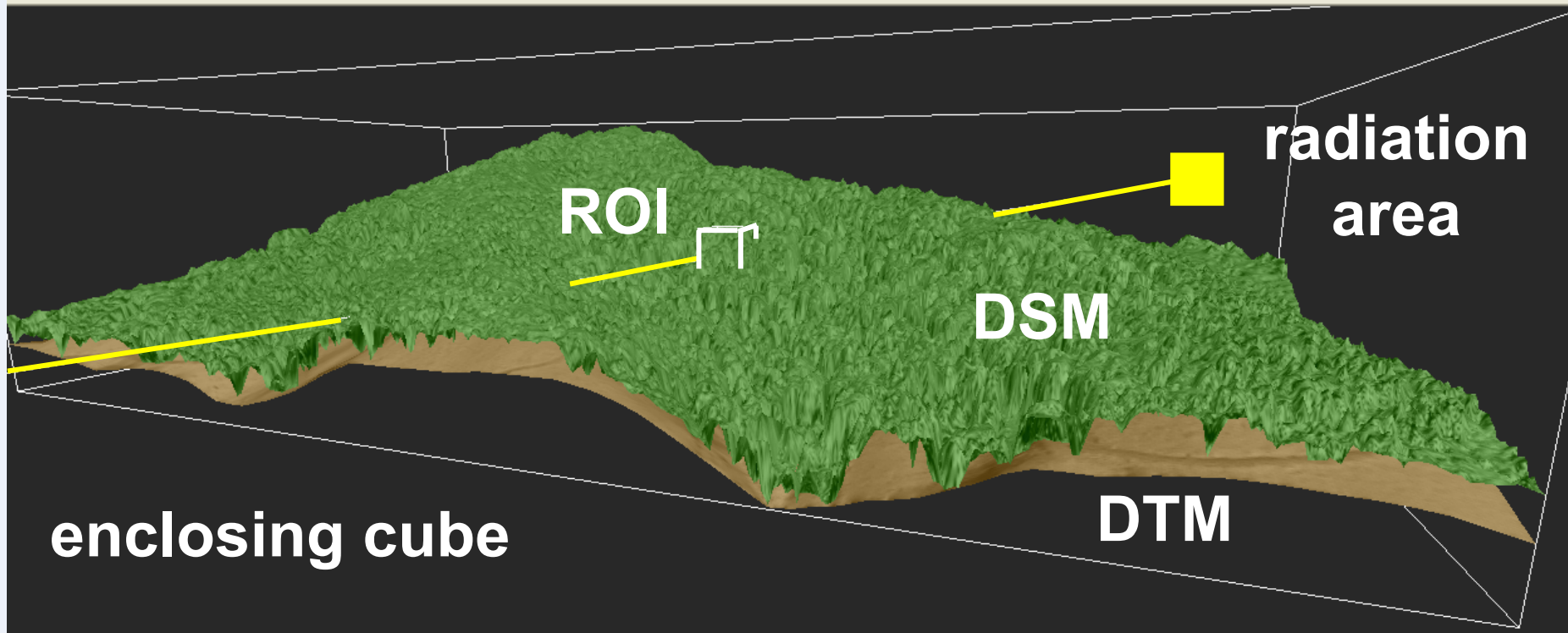


# Methods: Sun position



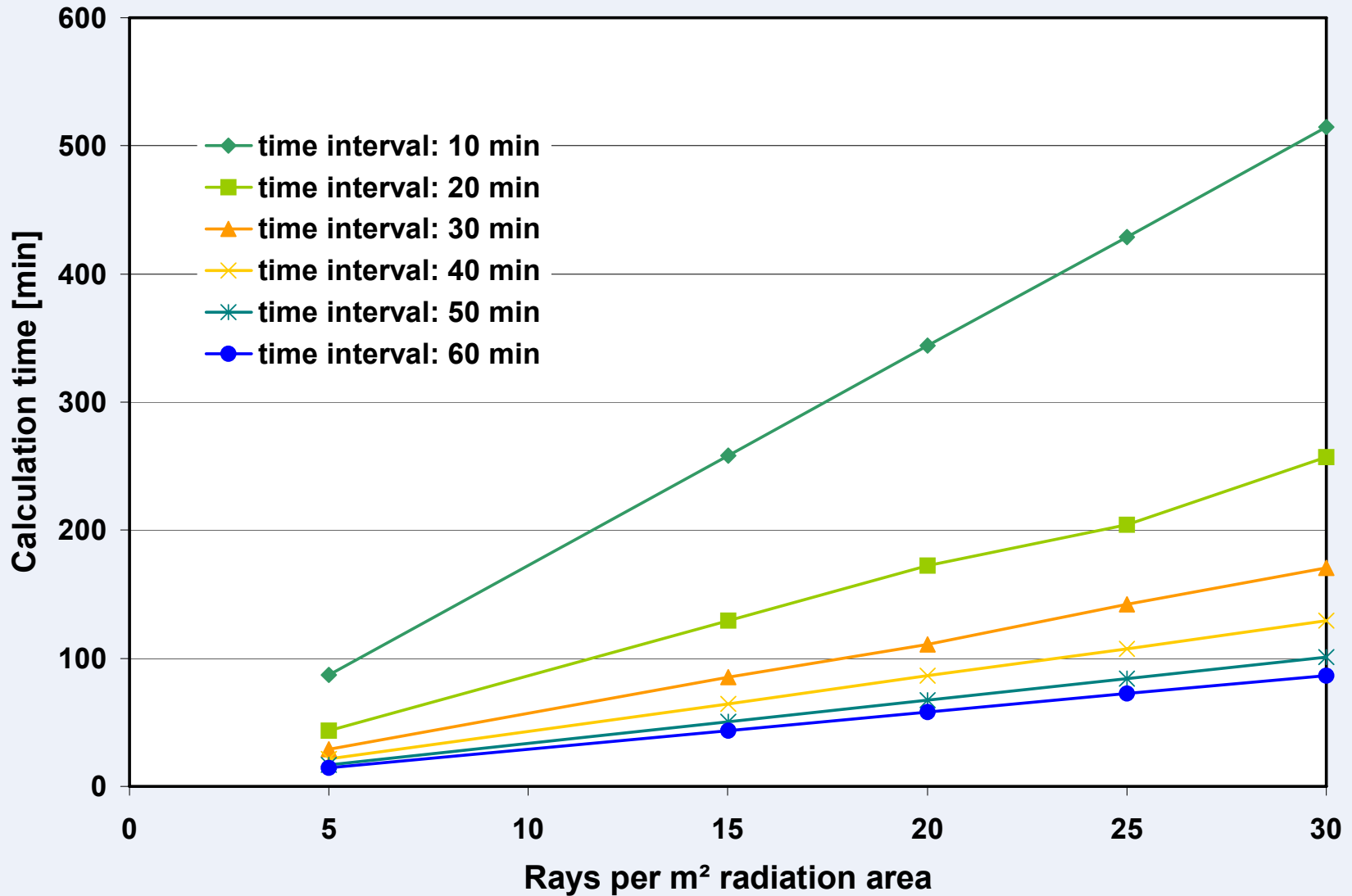
- Input values: time, geographical position
- Position calculated for optional time intervals

# Methods: Ray tracing

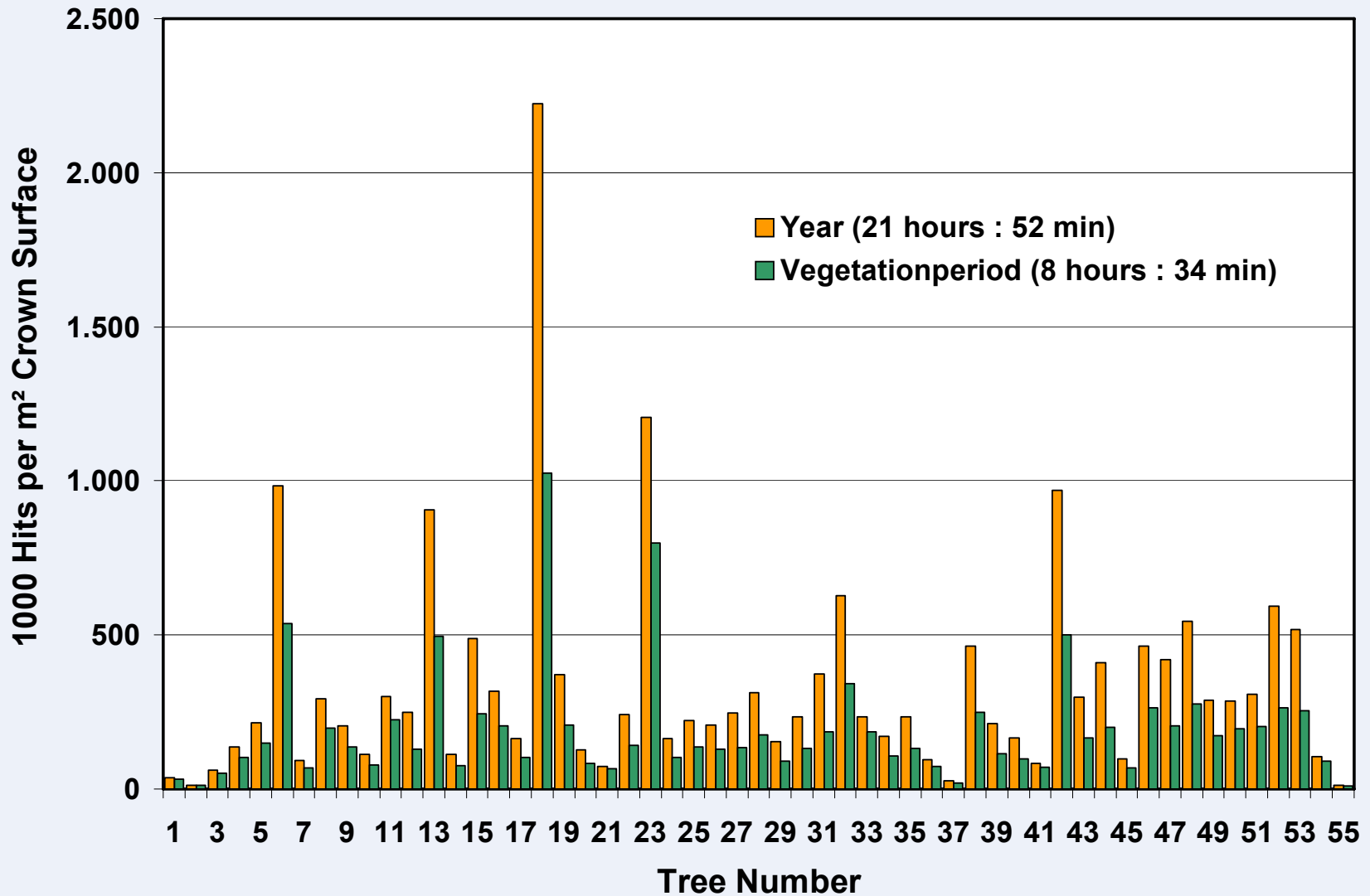


- Following rays until first intersection with optical surface
- Ray density per  $\text{m}^2$  radiation area is choseable

# Results: Runtime performance



# Results: High resolution datasets





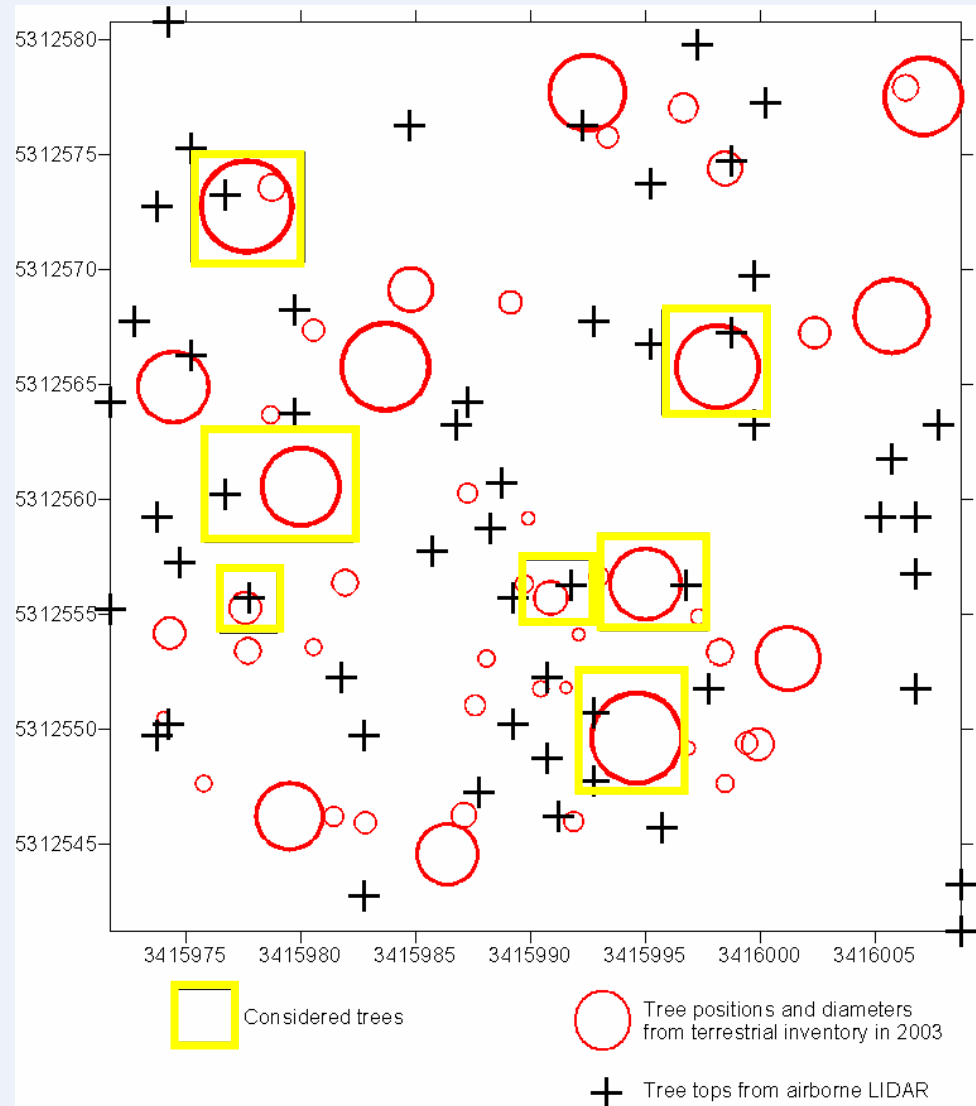
# Results: Selection of sample trees

## Study site:

Highly structured,  
mixed species stand  
with understorey.

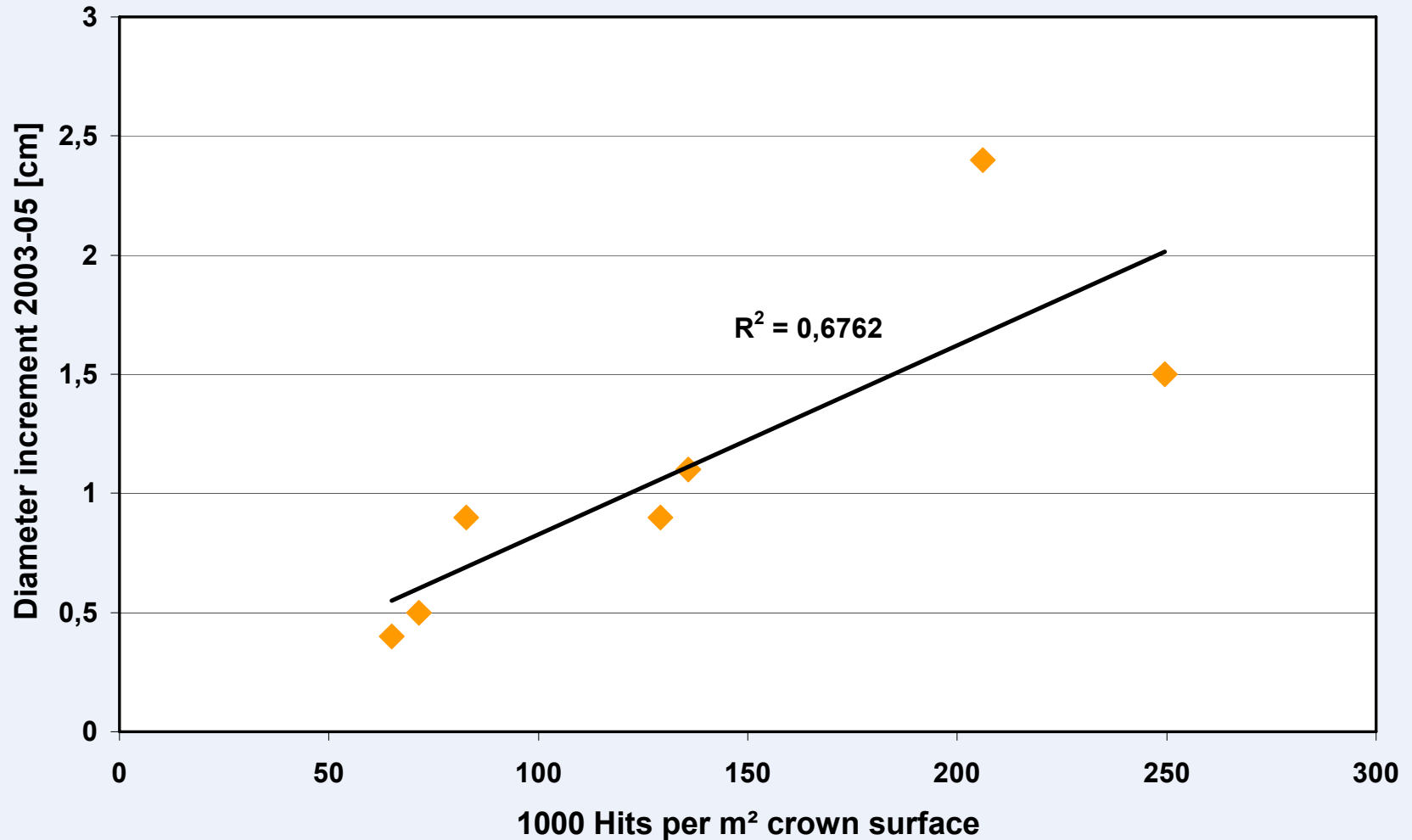
Tree position and DBH  
measured in 2003 and  
2005

Tree-to-tree matching:  
Manually, position and  
tree height.



# Results: Diameter growth reaction

Hypothesis: Trees receiving more sun hits will grow faster than others.



# Conclusions and Outlook

- **The method is working consistently.**
- **Integration in TREESVIS makes calculation to be a by-product of analysing laser scanner data.**
- **The better single tree delineation is working the better will be the results of determining light reception of single trees.**
- **Systematical tests in purely structured stands should be added.**
- **Radiation energy and recognition of diffuse radiation should be integrated.**