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► **To cite this version:**

M. Saudreau, Boris Adam, Sylvain Pincebourde. Modelling spatial and temporal leaf temperature dynamics at leaf and canopy scales. Workshop HETEROCLIM, Jun 2014, Loches, France. IRBI - LEGS, 1 p., 2014, The response of organisms to climate change in heterogeneous environments. hal-01268583

HAL Id: hal-01268583

<https://hal.science/hal-01268583>

Submitted on 3 Jun 2020

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MODELLING SPATIAL AND TEMPORAL LEAF TEMPERATURE DYNAMICS AT LEAF AND CANOPY SCALES

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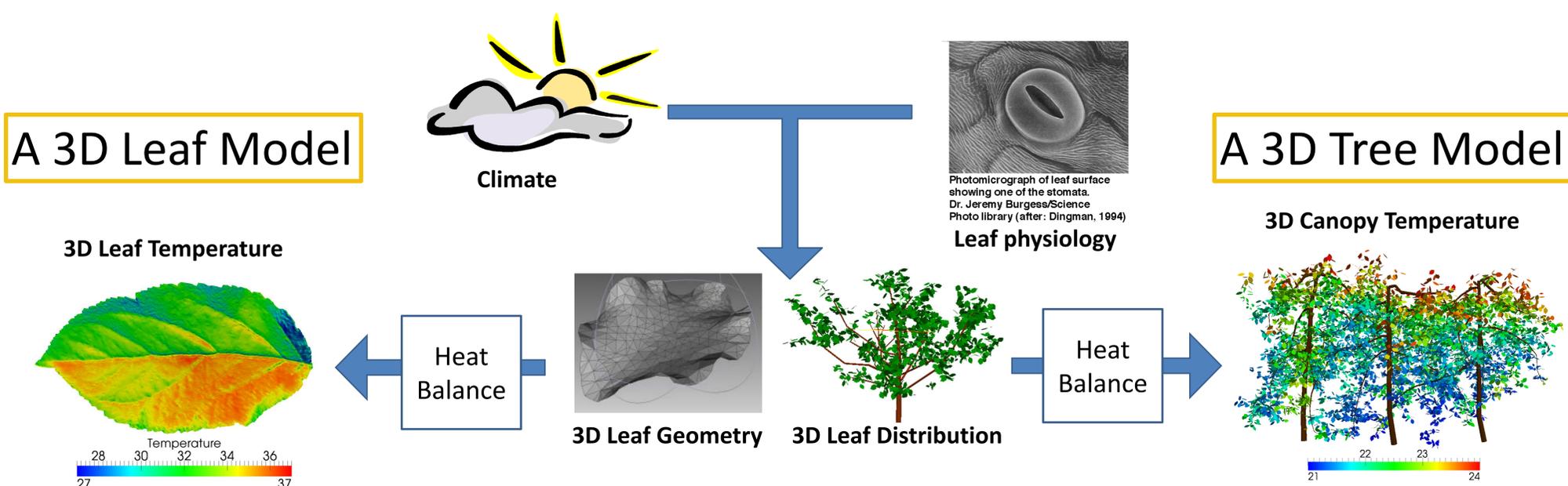
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Thermal Heterogeneity in Tree Canopies

Leaf temperature is an important factor involved in many biological processes such as leaf transpiration and photosynthesis, leaf – pathogen interactions or insect development. A high **spatial variability** in leaf temperature dynamics (**frequency, amplitude, spatial gradients**) at **canopy scale** (shaded leaf versus sunlit leaf) and at **leaf scale** (leaf geometry, edge effect, boundary layer) is observed. Such variability results from changes in energy exchanges between the leaf and its local environment.

A modelling work was developed by IRBI and PIAF labs to predict leaf temperature heterogeneity and insect development at the **leaf scale** (a 3D leaf model) and at the **canopy scale** (a 3D tree model).

Modelling Leaf Temperature Heterogeneity

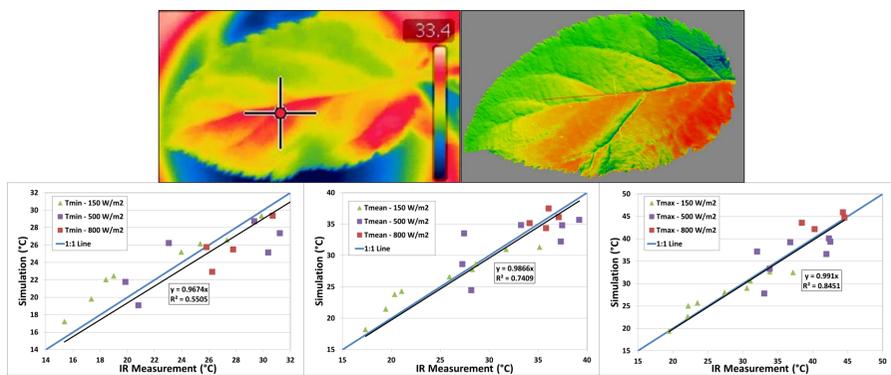


Schematic view of the main features of the 3D leaf model and the 3D tree model

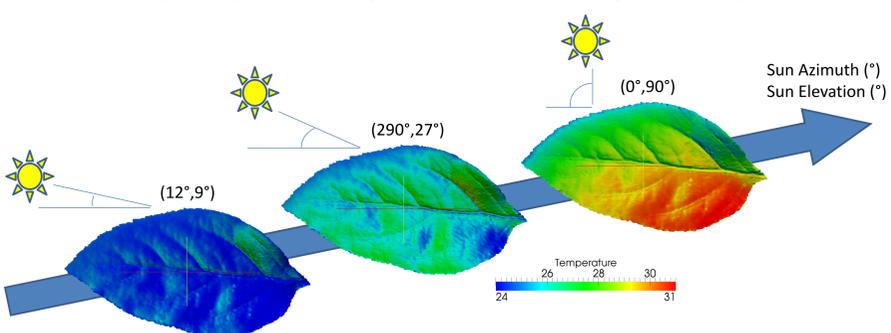
Simulating Leaf Temperature Heterogeneity

Leaf Scale

Temperature measurement vs Simulation

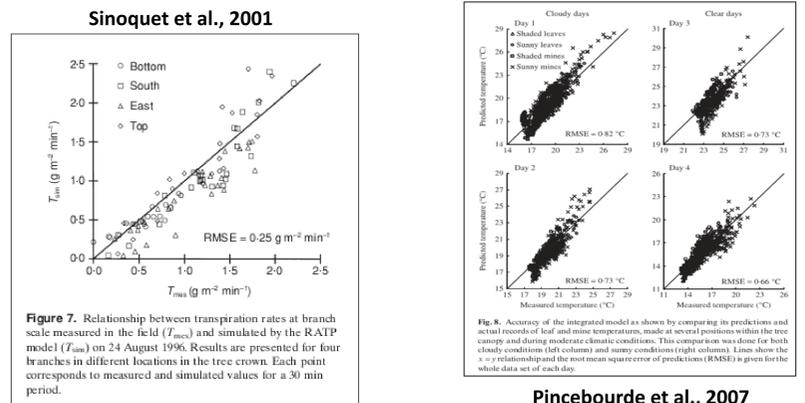


Variability in leaf temperature patterns
(Temperature pattern and sun position)

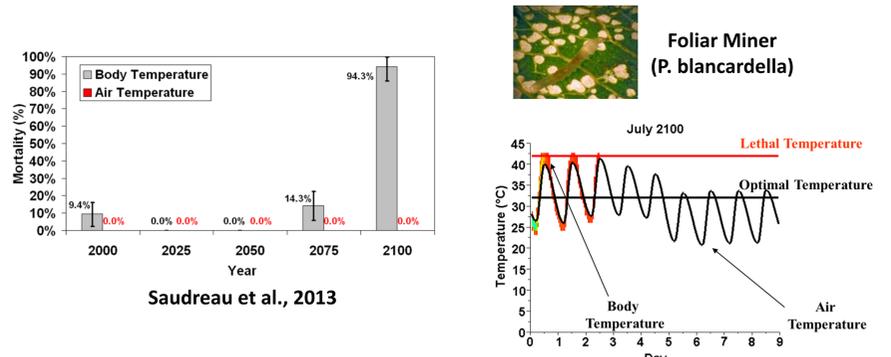


Tree Scale

Temperature measurement vs Simulation



Climate change and insect mortality
(Air temperature vs Body temperature)



Acknowledgement - This work was funded by the French National Research Agency project MicroClimMite No ANR-10-BLAN-01706-02