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

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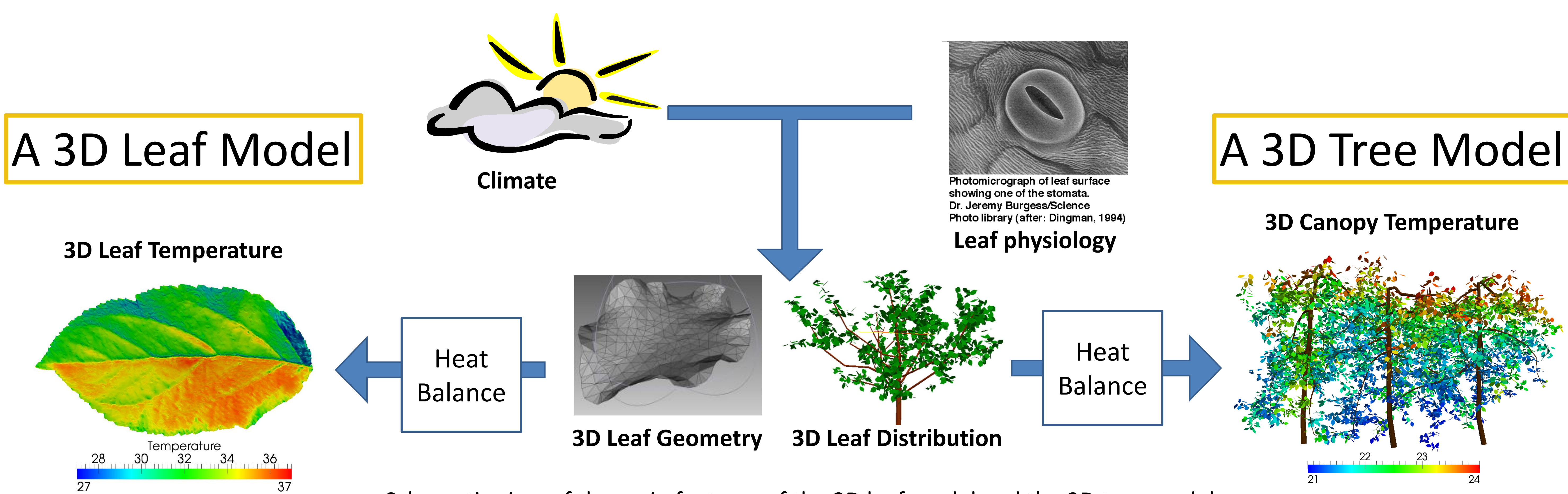
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Thermal Heterogeneity in Tree Canopies

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

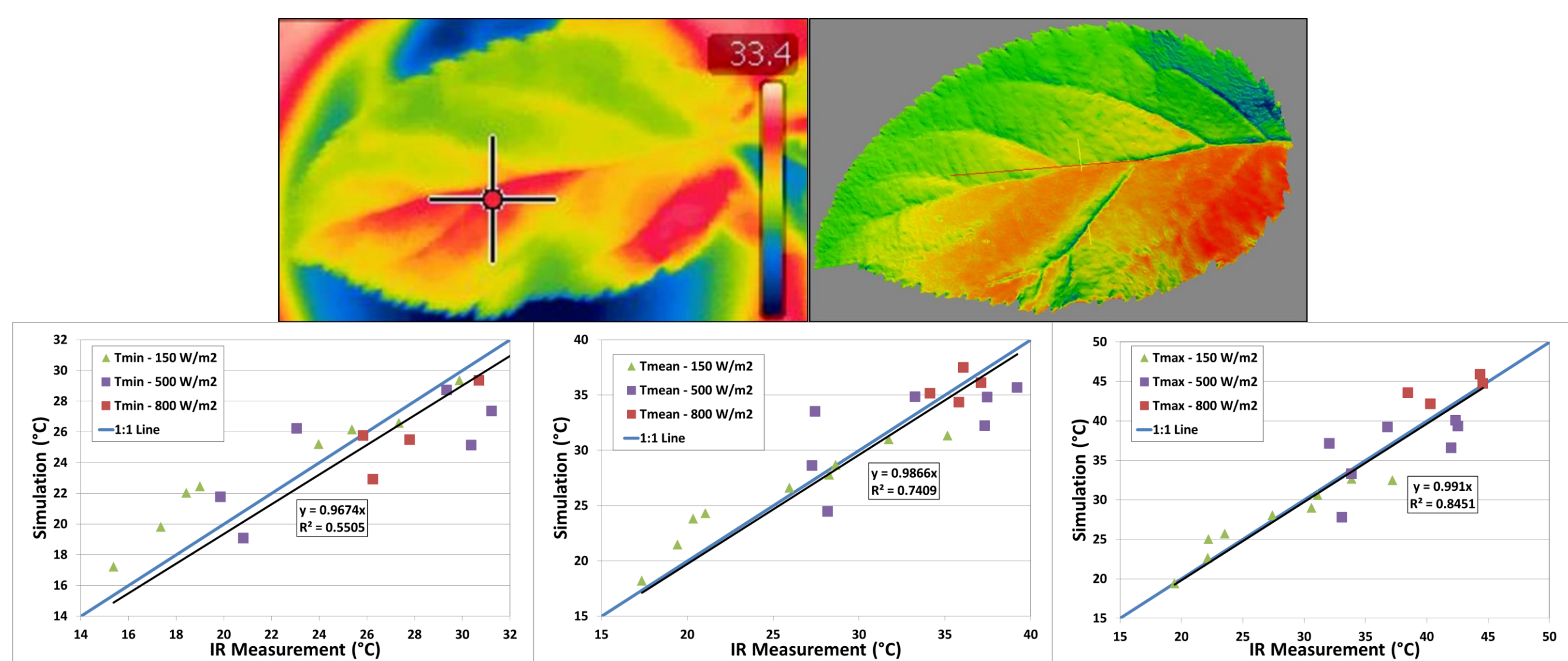


Schematic view of the main features of the 3D leaf model and the 3D tree model

Simulating Leaf Temperature Heterogeneity

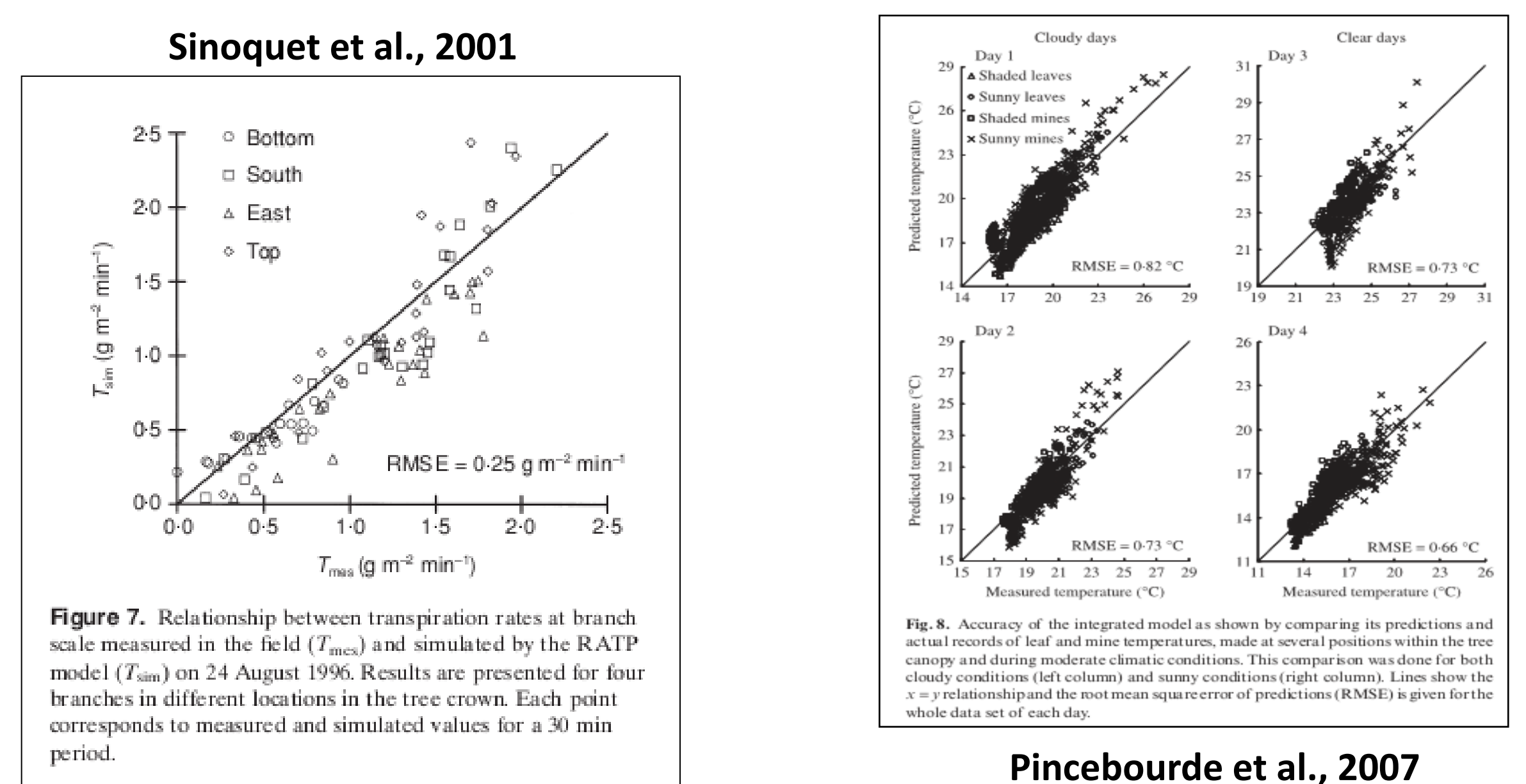
Leaf Scale

Temperature measurement vs Simulation

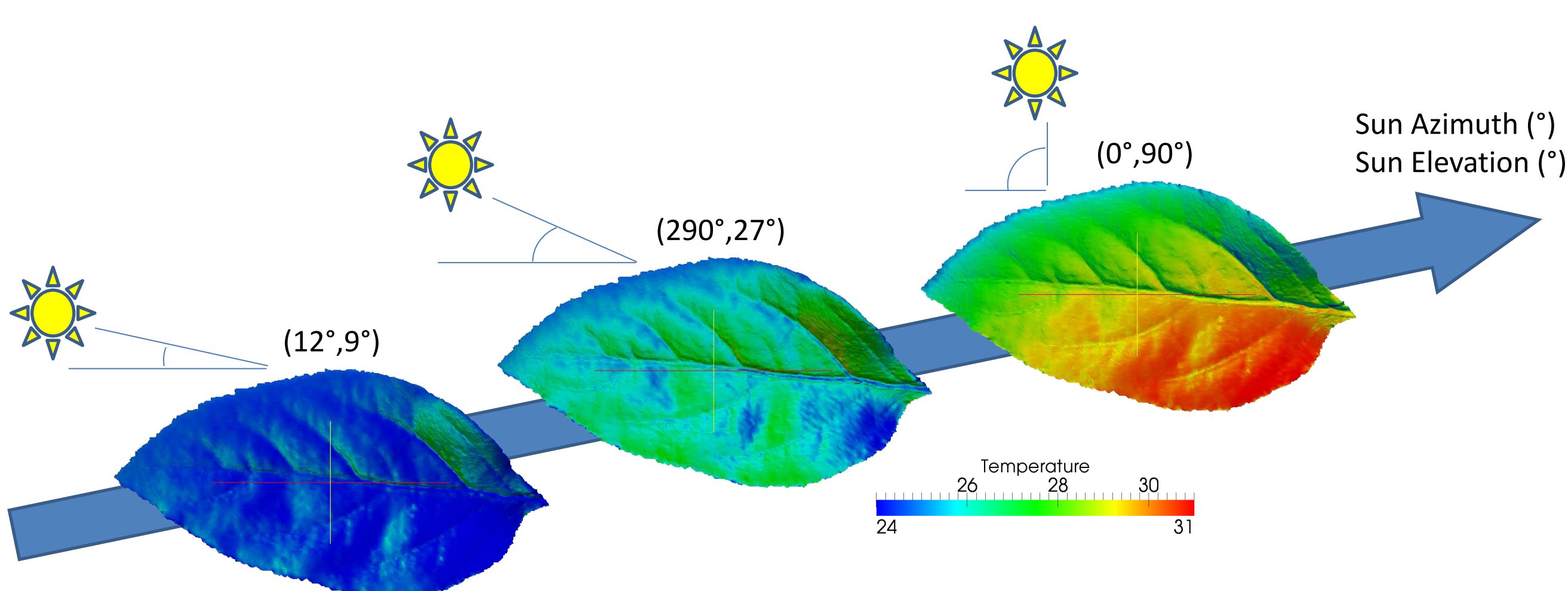


Tree Scale

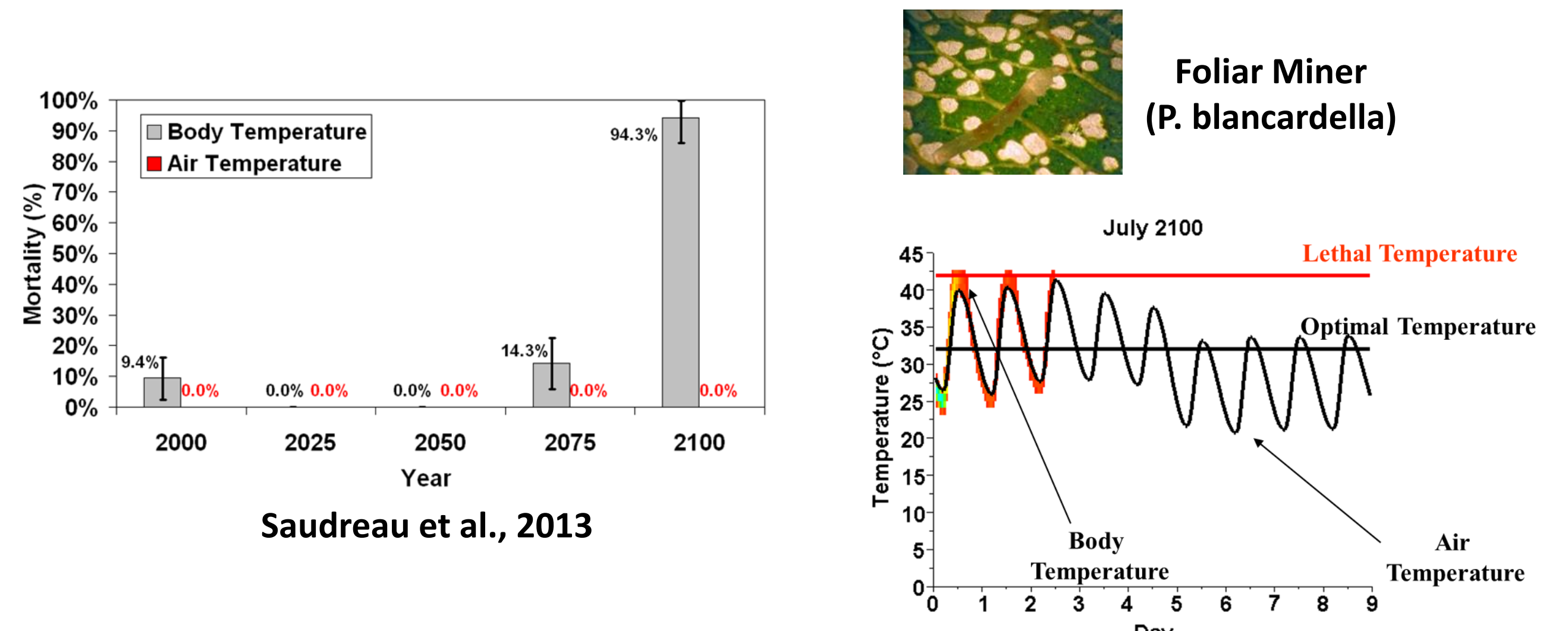
Temperature measurement vs Simulation



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



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



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