Where I work
Jan Pisek

Photographed by
Marja-Liisa Plats.

"The better researchers understand what happens to sunlight when it hits Earth, the better they can estimate its effects on climate. Part of this means creating reliable models of what happens when light hits trees.

During my PhD at the University of Toronto, Canada, I worked on satellite maps showing the global coverage of vegetation, including conifers. I learnt how what happens at the leaf and branch level is key to grasping what happens at larger scales.

The unique geometries of conifers, in particular, make it hard to interpret satellite data acquired from areas in which they are dominant. Studies have disagreed on how sunlight is scattered when it hits the trees' needles, so estimates of the combined mass of all the needles in a conifer forest have been unreliable.

In this photo, taken at the University of Tartu in Estonia, where I work, I am using photogrammetry to stitch together multiple 2D images to create a high-resolution 3D model of a twig from a Norway spruce (*Picea abies*) and its needles (which grow in clusters called shoots). My colleagues and I used this model to calculate the proportions of needles at different orientations, and how they're clustered. We found that much of the simulated sunlight was scattered and then absorbed by the tree's needles. In other words, the geometry that the conifers have evolved provides them with extra energy for photosynthesis – and explains why conifer forests often look darker than forests of other trees.

I'm creating an open database of representative shoots for all 38 conifer species native to Europe. My hope is that these will clarify what happens when light is absorbed by conifers, and improve our understanding of stress and disease in trees, as well as of heat absorption by Earth's surface; evaporation and transpiration; and the role of forests as carbon sinks."

Jan Pisek is a physical geographer at Tartu Observatory, the University of Tartu, Estonia. **Interview by Nic Fleming.** This interview has been edited for length and clarity.