

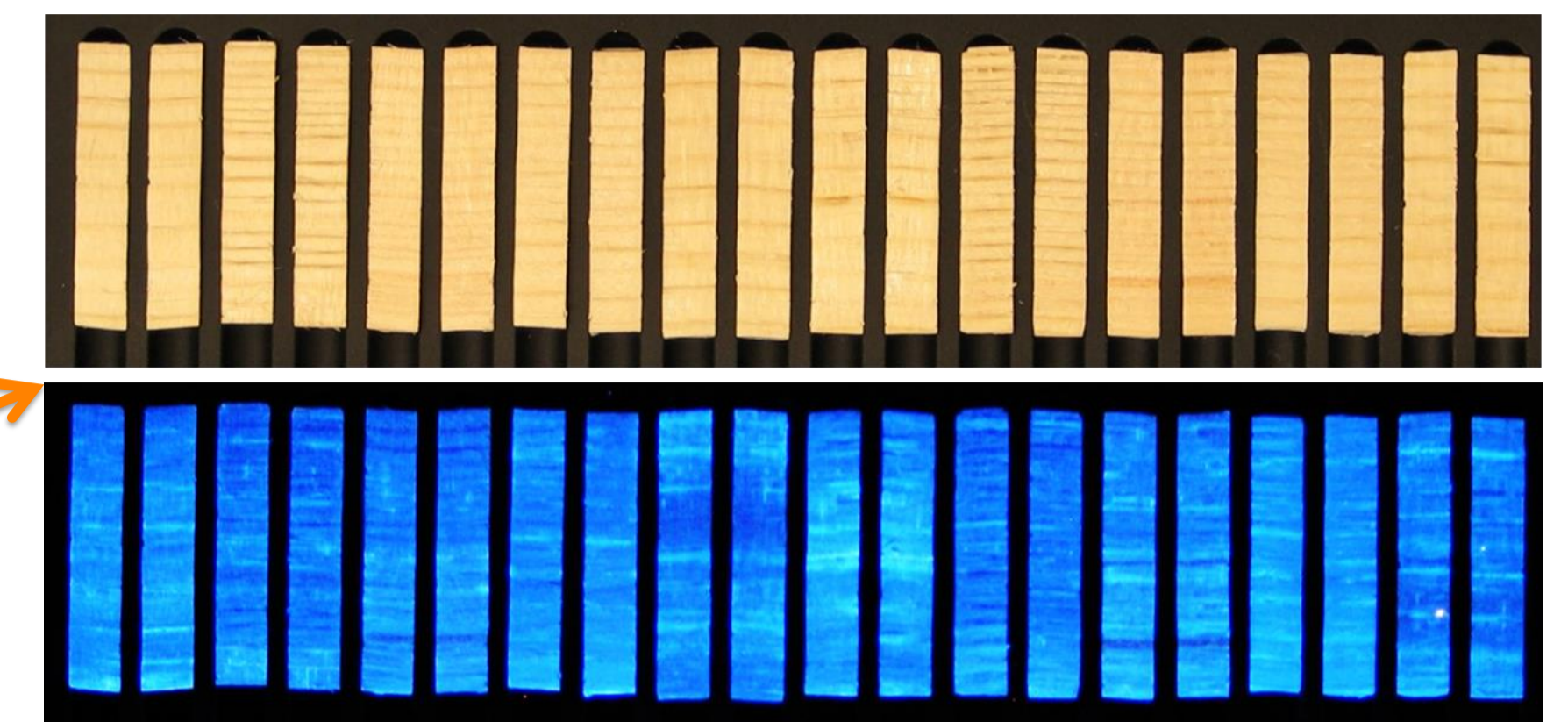
Optical Measurement of Scots Pine Heartwood Stilbene Content

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The optical measurement method developed in the TUIKEPUU project can be used to detect differences in stilbene content between Scots pine trunks using increment cores

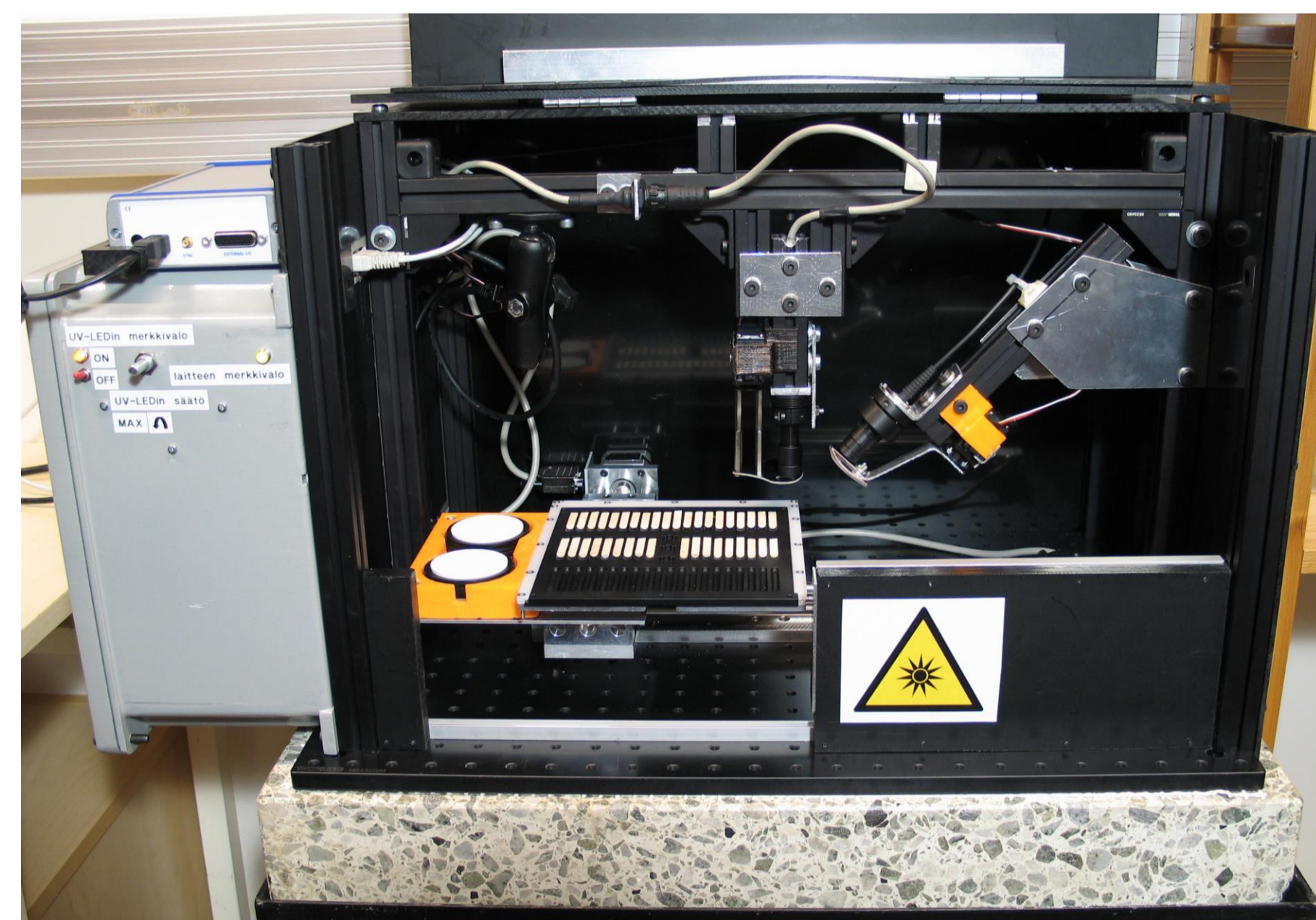
There is wide natural variation in stilbene content between Scots pine trunks. There are more stilbenes in the decay-resistant than in decay-susceptible pine heartwood.



Scots pine heartwood samples in sample plate grooves. In the upper picture the samples are shown in visible light. In the lower picture the samples have been exposed to UV excitation making stilbenes fluoresce.

Optical measurement

Dried heartwood samples are split and placed on the sample plate, which is put in the measurement chamber. UV excitation (315 ± 5 nm) is directed perpendicularly to the sample being measured. As a result of the UV excitation, the stilbenes present in the sample fluoresce visible light, the intensity maximum of which is 420 nm. Fluorescence is measured at a 45° angle with a fibre spectrometer, a single measuring point of which is about 4×5 mm.

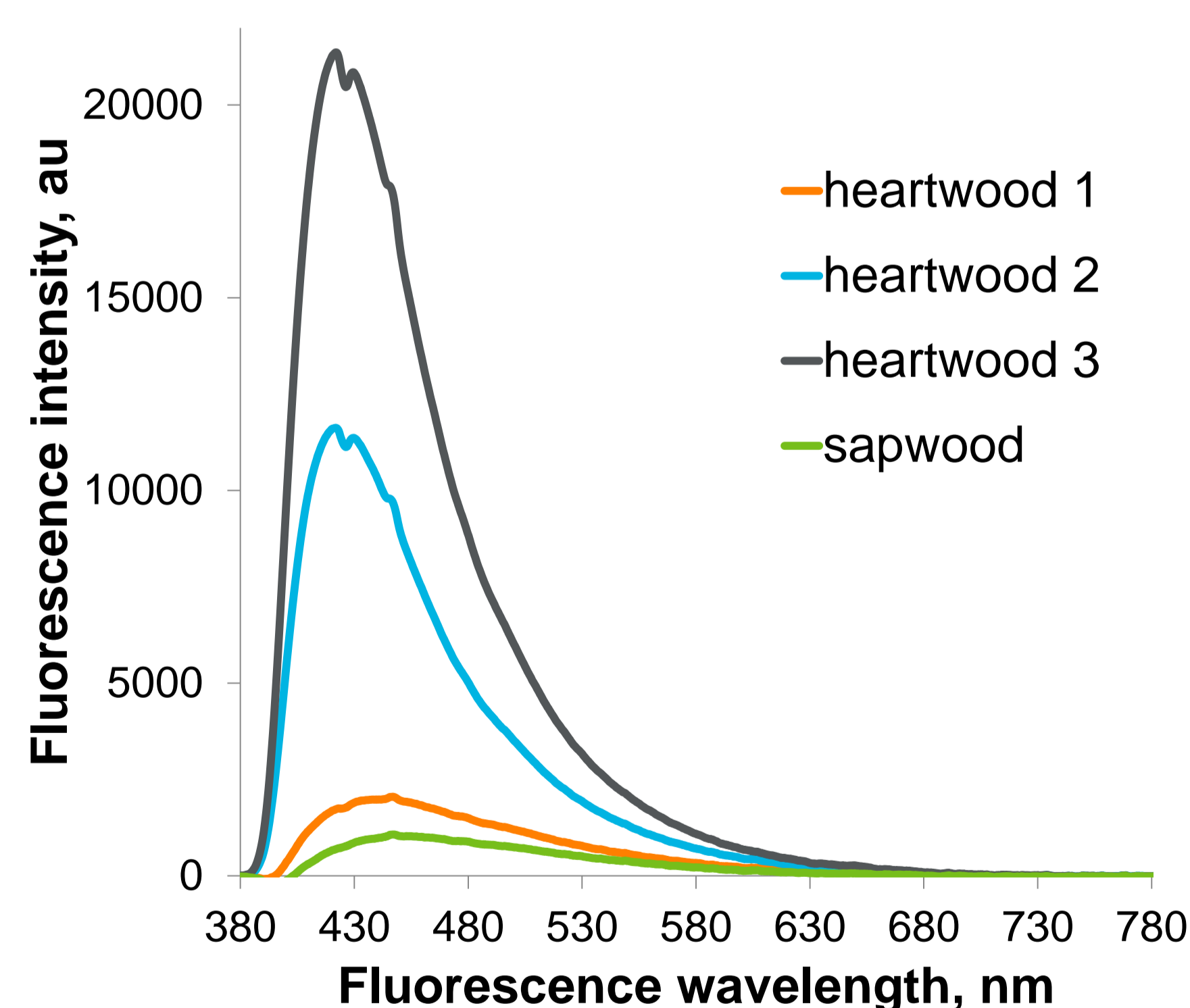


A front view of TUIKEPUU equipment with the measurement chamber door open. On the left side of the sample plate are the reference standards used for calibrating the equipment.

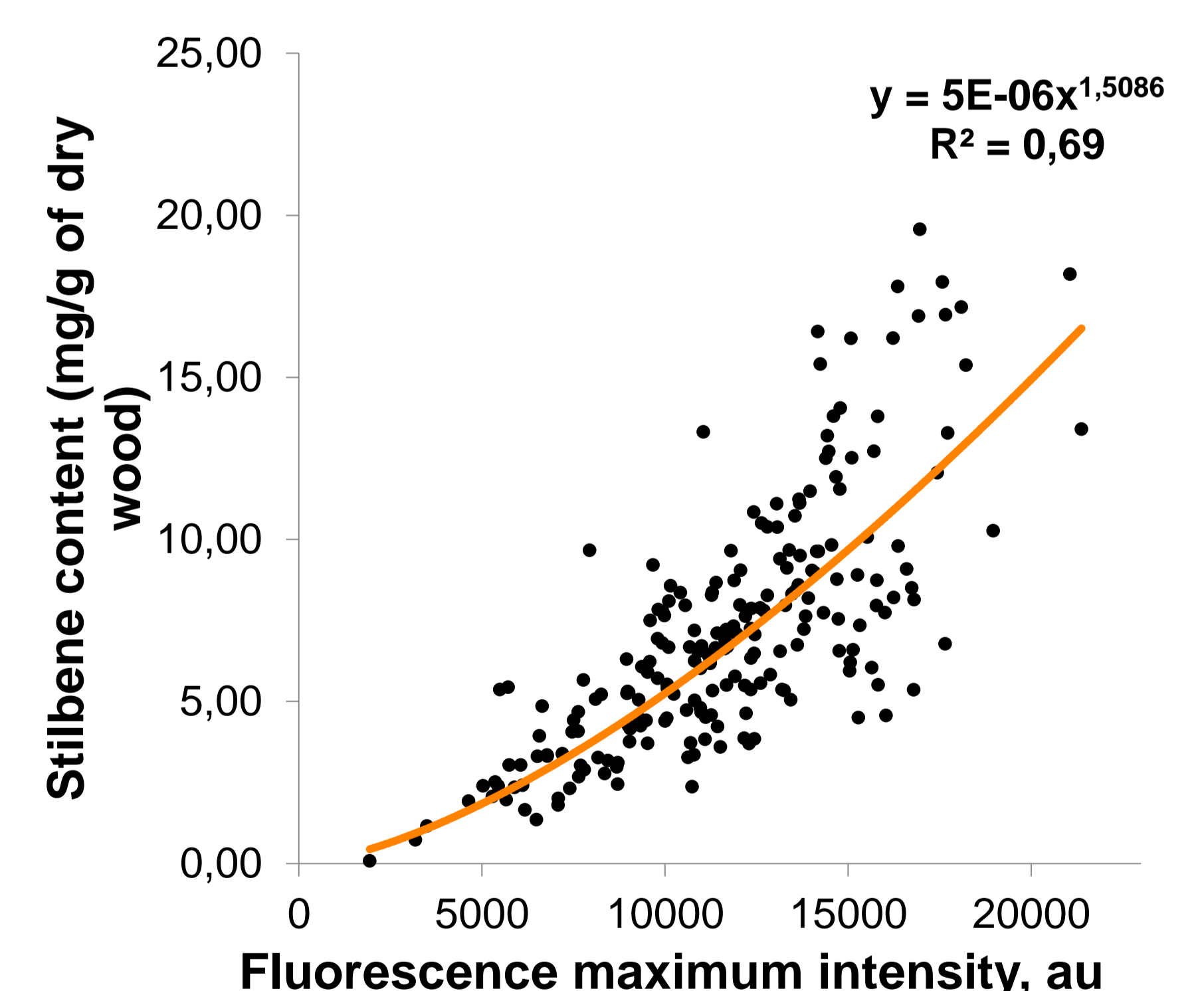
The increment core measurement has been automated with a moving sample plate. Fluorescence is measured step by step for the length of the sample. The measured spectra are corrected with a white reference. An average value for the sample is calculated from the maximum spectral intensity value of each measurement step. A total of 58 samples can be placed on the sample plate and measuring them takes less than 15 minutes.

Comparison of optical and chemical measurement

The correspondence between chemically analysed stilbene content and UV fluorescence of stilbenes was studied with increment cores collected from standing trees. Heartwood samples were drilled from 212 grafts in two mature Scots pine seed orchards owned by Metsähallitus. Two increment cores were drilled from each graft. The outer part of the heartwood of one of the cores was ground for chemical analysis performed with a gas chromatograph. The UV fluorescence measurement was performed on the outer part of the heartwood of the freshly split surface of the other core.



Differences in the stilbene content of the individual samples can be seen as intensity differences on the fluorescence spectrum. Presented are spectra from the extreme ends and the middle of the stilbene distribution of the heartwood samples, and the sapwood spectrum.



Based on the results, it can be concluded that stilbene fluorescence measurement could be applied to e.g. Scots pine heartwood sorting and selecting for tree breeding material. The method is quick and can be modified to suit different environments of use.