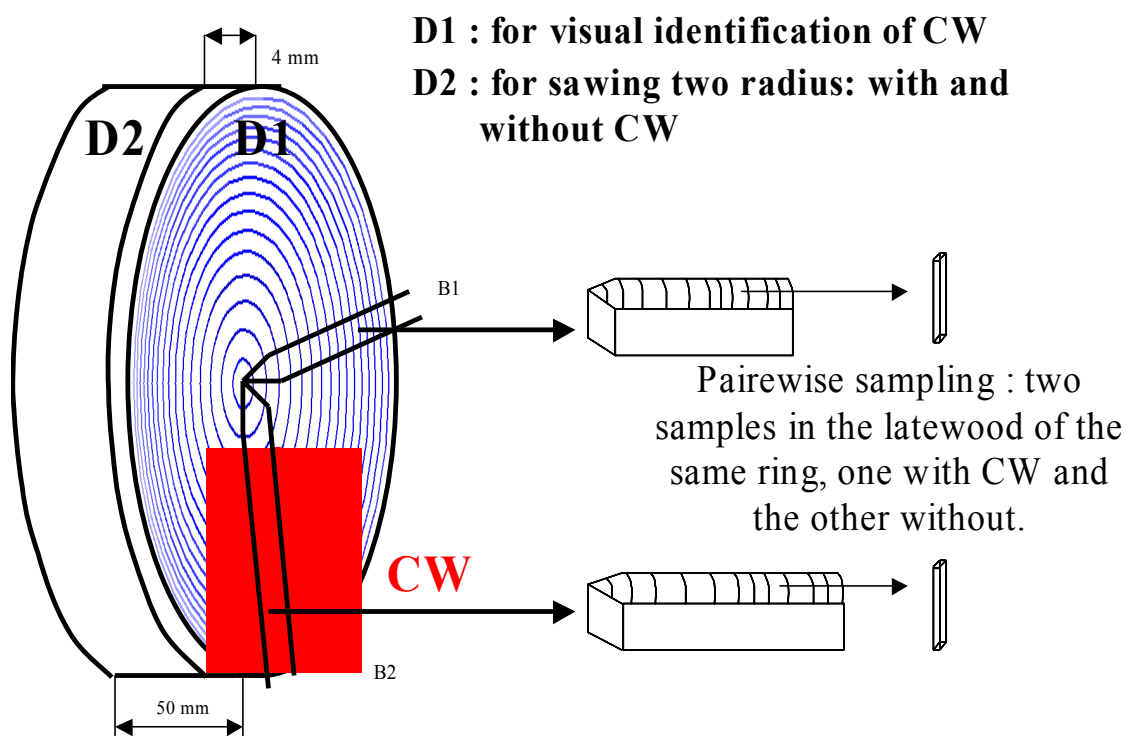


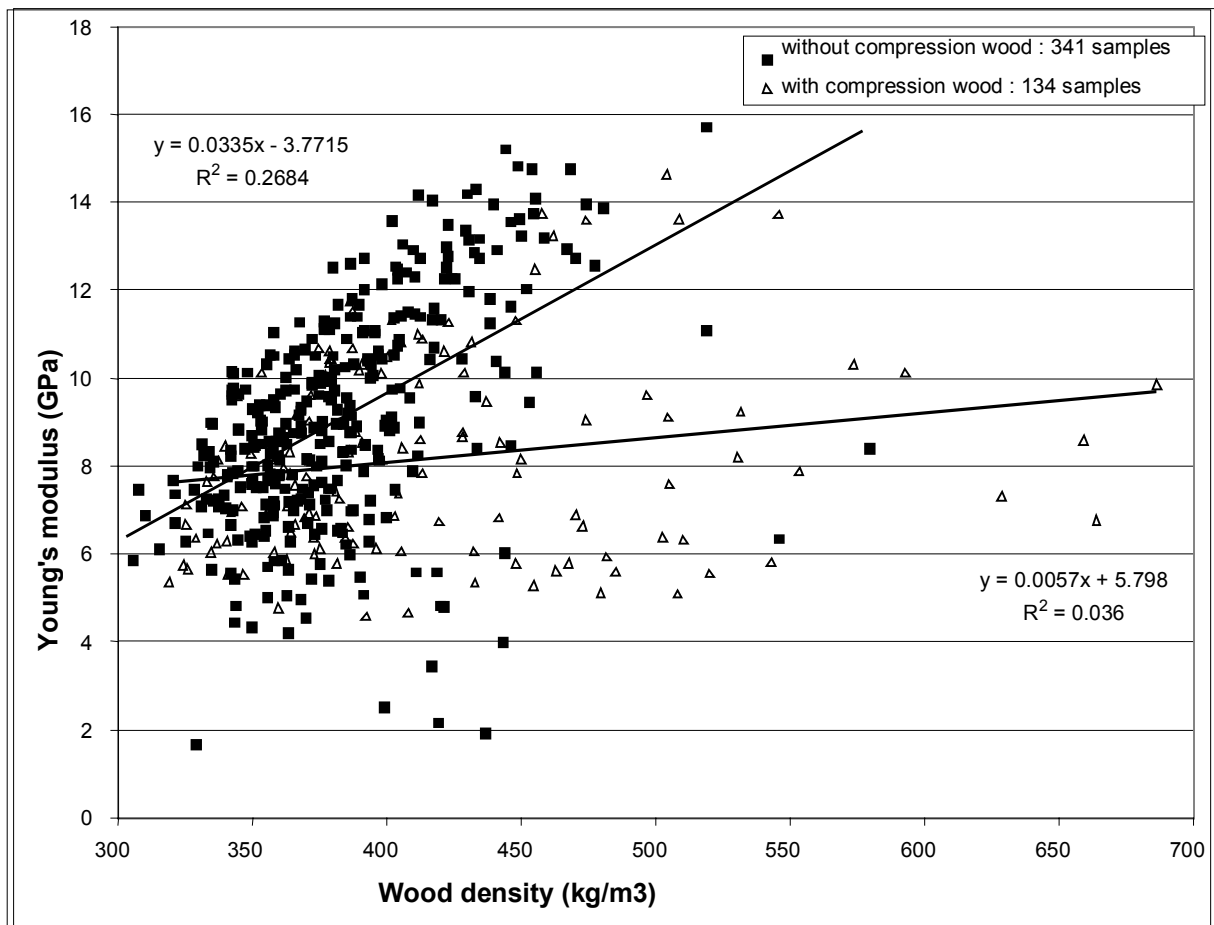
Preliminary analysis of relationship between compression wood and mechanical properties in small clear samples

Comparison of Young's modulus of normal wood and compression wood - INRA

Norway spruce strips have been sampled (as shown below) and tested in order to quantify the impact of compression wood on MOE-wood density relationships. A total of 475 strips were sampled and preliminary results (shown in the graph below) show that strips containing compression wood have a Young's modulus lower than strips without compression wood, and that the relationship between wood density and Young's modulus is weaker for strips with compression wood.

Pair wise sampling of small specimens with and without compression wood.





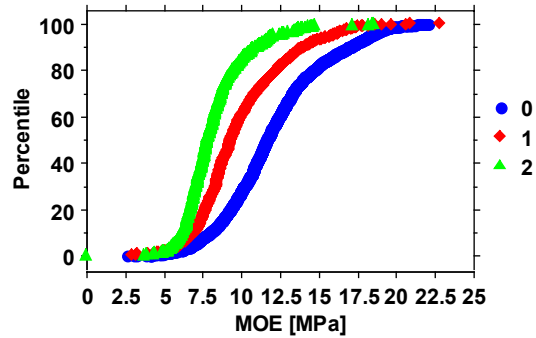
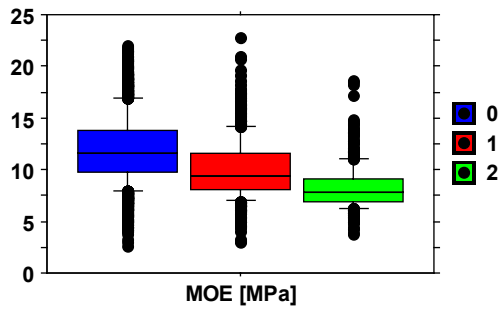
Mechanical properties of small clear samples – Chalmers University

Chalmers has classified a total of 4165 small clear samples into compression wood severity classes. The photograph below shows an example of one sample from each compression wood severity class. Of the 4165 samples, 2847 were classified as normal wood, 700 as containing mild compression wood and 618 as containing severe compression wood.



Examples of one sample from each compression wood severity class. The upper sample represents a stick classified as containing severe compression wood, the middle one was classified as containing mild compression wood and the lower one as containing only normal wood.

The variation in Modulus of Elasticity is significant between the different compression wood severity classes. Severe compression wood within the samples lowers the MOE compared to mild compression wood and normal wood, as shown below.

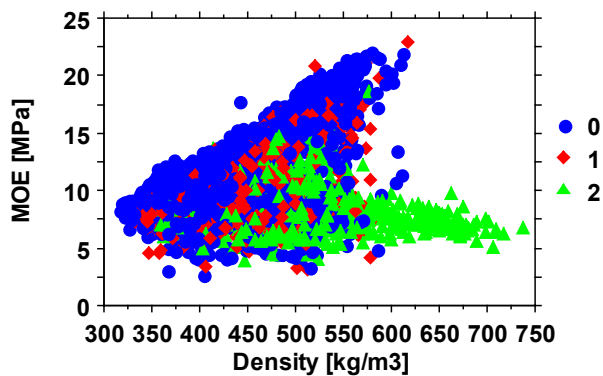


a) Box plot

b) Percentile plot

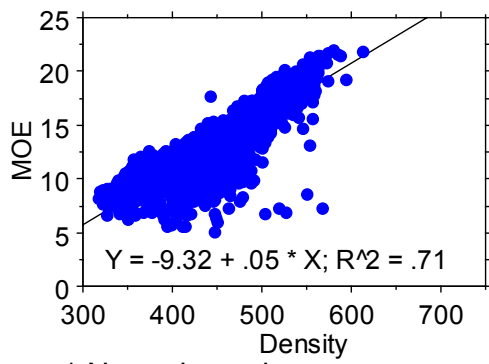
Influence of presence of compression wood (CW) on modulus of elasticity (MOE) (box plot showing 10th, 25th, 50th, 75th and 90th percentile). 0 is no compression wood, 1 is mild compression wood and 2 severe compression wood.

An interesting aspect of these data is the relationship between the different properties. Regression analysis between the different properties shows how the properties affect each other. The relationship between modulus of elasticity and density is normally rather good for small clear specimens. For this material with compression wood the relationship is not good, as shown below.

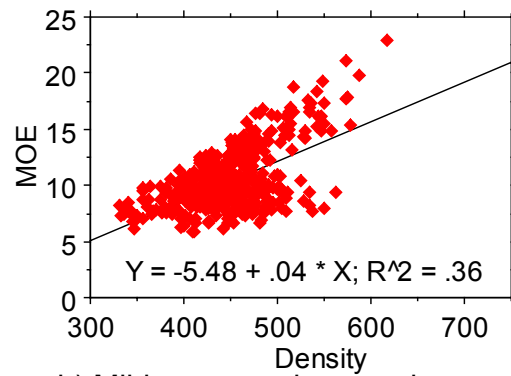


Relationship between modulus of elasticity and density.

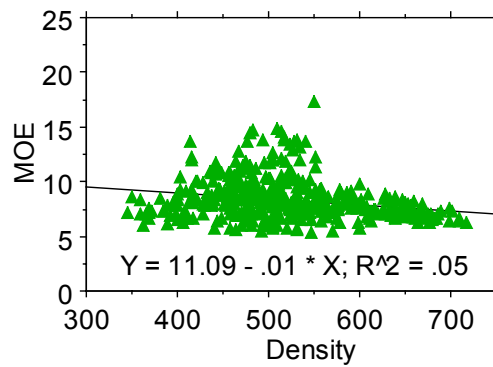
When the graph is split between different compression wood groups it can be seen that in each group the relationship is rather good. For the normal wood the relationship is about what can be expected, the higher the density the higher the modulus of elasticity. For sticks with severe compression wood the opposite relationship can be found, the higher the density the lower the modulus of elasticity.



a) Normal wood



b) Mild compression wood



c) Severe compression wood

Relationship between modulus of elasticity and density. a) Normal wood, b) mild compression wood and c) severe compression wood.