

Tree Motion and Wind Measurement

Report by Barry Gardiner, Coordinator of IUFRO WP 8.03.06

The international Tree Motion and Wind Measurement Workshop on 23-25 April 2018 at the Danish Technical University, Risø Campus, in Roskilde was sponsored by IUFRO Working Party 8.03.06 - Impact of wind on forests.

This meeting resulted from conclusions written by Dr. Ian Harman of CSIRO, Australia following the 8th Wind and Trees conference in Boulder, Colorado in July 2017 (<https://www.mmm.ucar.edu/wind-and-trees>). In that report he made the following observation:

“The community is not always talking in the same language; certainly the community does not share a common base of underpinning knowledge. Some form of coordinated effort across the sub-communities could be beneficial to assist with this - as well as assisting with multiple research/management aims”.

Based on these very pertinent comments it was felt that a workshop that addressed the needs of the two communities (meteorologists and tree/forest biologists) to make accurate and appropriate measurements of the wind and of tree movement was required.

The workshop offered:

Lectures and discussions on the best methods for measuring wind speed close to trees or within forests: The latest techniques using LiDAR and SoDAR for remotely measuring wind speed were presented and are producing excellent results over large areas. However, issues still remain with regard to measurement within forest canopies because of the difficulties presented by the presence of branches.

Lectures, discussion and exercises on measurement of tree movement: Different systems and their pros and cons were discussed as well as the analysis of data. This included participants working together to analyze different data sets with the same software to allow direct comparison from different experiments.

A resume of the modelling of tree movement, both static and dynamic: The talks discussed analytic solutions and numerical systems, including the use of FEM for modelling the complex interaction between branches and tree stems.

A discussion of how to use knowledge on wind flow in forests and tree movement to build wind risk models for forest stands and individual trees: Among other things, it was demonstrated how such models can be linked to airflow models to calculate wind risk across landscapes was demonstrated.



Oak tree at Risø campus, Roskilde, which is monitored for movement in the wind. Masts are instrumented with sonic anemometers to measure the flow in front of and behind the tree.
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Conclusions:

Substantial progress has been made in the last two decades in our ability to measure wind speeds in forested areas and to monitor the movement of trees. Some of these techniques have become routine and standardized. But there is a clear need for researchers to understand what techniques and tools are appropriate to their needs and to use the simplest and most straightforward approach that is possible. The complex measurement and modelling systems are excellent for advanced research questions but will not be appropriate in all circumstances where simpler and usually less expensive approaches are appropriate.

Read the full report at: <https://www.iufro.org/science/divisions/division-8/80000/80300/80306/activities/>