Mechanics of Wood and biocomposites in engineering

TRACK Number (****1000 Computational Solid Mechanics****)

Dr.\_Ing. Ani Khaloian \*, Dr. Markus LUKACEVIC †   
and Prof.Dr.ir. Jan-Willem van de kuilen\*+

\* Faculty of Civil, Geo and Environmental Engineering, Department of Wood Technology, Technical University of Munich, 80797 Munich, Winzererstrasse 45, Germany

khaloian@hfm.tum.de

† Faculty of Civil Engineering, [Institute for Mechanics of Materials and Structures](https://www.imws.tuwien.ac.at/en/), TU Wien, Karlsplatz 13/202   
A-1040 Vienna, Austria

[Markus.Lukacevic@tuwien.ac.at](mailto:Markus.Lukacevic@tuwien.ac.at)

+Faculty of Civil Engineering and Geosciences, Delft University of Technology, Stevinweg 1, 2628 CN Delft, Netherlands

vandekuilen@hfm.tum.de

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ABSTRACT

This session focuses on the use of computational techniques to better understand the mechanical behavior of wood and bio-based structural materials. The underlying mechanics of such materials is characterized by a rather complex nonlinear behavior that involves anisotropy, viscoelasticity, elasto-plasticity, damage, etc., which can get even more complex under environmental influences such as due to moisture and temperature variations. The material properties of such materials are strongly varying from one material point to the other. In addition, natural heterogeneities of these materials are influencing the structure of the fibers and correspondingly affecting their mechanical responses. Therefore, considering complexities of such materials under mechanical and environmental conditions, the material needs to be strength graded before it is used for engineering applications [1, 2]. Additionally, failure of such materials follows an anisotropic behavior including both ductile and brittle failure modes, depending on the loading configurations [3]. Mainly simplified material models are used/replaced for simulations to describe the behavior of these materials. However, the models need to sufficiently cover the relevant phenomena for efficient simulation/optimization to support design decisions [4-6]. As already shown, a complex system of problems needs to be solved in order to be able to use timber and its products appropriately for structural applications. This session aims to discuss recent advances in computational wood mechanics and its engineering applications, as well as in computational mechanics fields related to bio-composites, where the focus is put on modeling methodologies.

Topics of interest for this invited session are:

* Time-dependent static, quasi-static and dynamic analysis
* Stochastic modelling and optimization
* Development of new material models
* Model order reduction and computational efficiency
* Damage and failure
* Validation and verification of the numerical problems

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