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Disentangle Viscoelasticity on Primary Plant Cell Walls[1] JACOB SEIFERT, Oxford Univ-USE 4643, IAN MOORE, University of Oxford, Department of Plant Sciences, SONIA CONTERA, University of Oxford, Department of Physics, BIOMECHANICS OF PLANTS COLLABORATION — The mechanics of plant growth, the ultimate result of plant development, is primarily determined by the mechanical properties of the primary cell wall (CW). This CW is an intricate composite material made from a compliant matrix and a fiber network. The mechanics of cells can be measured elastically and viscoelastically by quasi-static and dynamic, such as contact-resonance and multi-frequency, atomic force microscopy (AFM) techniques. While the quasi-static measurements already found application on living plant tissues, viscoelastic measurements give the dynamic component which is important for growth. They have been, however, only applied to isolated animal and bacterial cells using the Kelvin-Voigt model, so far. Here, we applied dynamic AFM methods to measure the viscoelastic properties on living plant tissues and extended the model to the linear standard solid model, which is more appropriate for polymeric materials, and gives quantitative information about the viscoelastic response time. Furthermore, we show that an alteration of the plant cell wall material composition and organization by chemical treatment can be mapped using dynamic AFM methods to spatially display a change of the material and disentangle results previously found from quasi-static measurements.

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Jacob Seifert
Oxford Univ-USE 4643

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