

Spatially and temporally resolved measurement of xylem and phloem flow by NMR micro-imaging

Markus Rokitta¹, Andreas Peuke², Ulrich Zimmermann³, Axel Haase⁴

¹*Physikalisches Institut EP5, Am Hubland, Wuerzburg, Germany;
rokitta@physik.uni-wuerzburg.de*

²*Institut fuer Forstbotanik und Baumphysiologie, Professur fuer Baumphysiologie,
Am Flughafen 17, Freiburg im Breisgau, Germany*

³*Lehrstuhl fuer Biotechnologie, Biozentrum, Am Hubland, Wuerzburg, Germany*

Abstract

An introduction to nuclear magnetic resonance (NMR) flow measurement on plants is given in this article. Practical considerations due to the need for special equipment are discussed as an introduction for the reader not yet familiar with NMR techniques. Examples demonstrate the current achievements and limitations with respect to spatial and temporal resolution. The outlook points out current developments for *in-situ* experiments.

Introduction

Most readers might have heard about nuclear magnetic resonance (NMR) in a medical context. Its non-invasive character makes this technique particularly popular for application on humans. Another less known but equally important advantage of NMR is its sensitivity to a vast number of contrast mechanisms. Investigation of chemical properties was the first application even before imaging techniques were introduced. Mapping of NMR relaxation times (which can be an indicator for mobility of water (van As et al., 1986; Veres et al., 1991), diffusion constants or even pH are just a few other examples. Most applications use the proton NMR signal, but there are other NMR active nuclei like sodium, which can be used for mapping sodium uptake in a plant