



## **A new window to the rhizosphere by magnetic resonance imaging**

Sabina Haber-Pohlmeier (1) and Andreas Pohlmeier (2)

(1) Institute of Technical and Macromolecular Chemistry, RWTH Aachen University, Germany (shaber@mc.rwth-aachen.de),

(2) Forschungszentrum Jülich, ICG-4, Germany

Magnetic resonance imaging is most useful for 3D non-invasive visualization of subsurface structures and processes. Especially imaging of the rhizosphere is of great interest, since here soil properties can be altered by the activity of the root. This leads to phenomena like locally enhanced water content, as pointed out by Carminati et al. 2009. On the other hand in the past depletion zone have been observed by MRI. The use of contrast agents is helpful for the further investigation of processes in the rhizosphere.

Here we report about recent measurements on the motion of the conservative contrast agent GdDTPA in the vicinity of the root. Setup was a) a conventional cylindrical container, and b) a planar rhizotron in which the vicinity of selected roots is directly accessible by drilled holes in the wall. MRI Resolution was about 0.6 x 0.6 mm. For the optimal contrast a spin echo multislice sequence was used where the contrast agent was highlighted by the choice of short repetition times combined with a short echo-time leading to strong T1 weighting. Additionally most recent results obtained in small growing vessels with a resolution of about 0.05mm will be presented.

Starting point is always a water depleted root soil system ([U+F071]

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0.12) into which a small amount of tracer is injected in the vicinity of a root. Frequently a zone of reduced intensity around the root is observed, which is passed by the contrast agent after sufficiently long time. This is proved by the appearance of the contrast agent inside the root, where it is transported slowly toward the shoot. We can conclude that the rhizosphere appears as zone of less intensity around the root, which was passed by the tracer to be monitored again in the inner part of the root system.