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Transport of metal and water in plant roots: Modelling and Analysis

We study the problem of metal and water transport through plant roots. The model equations reflect the complex microscopic structure of a root tissue. We distinguish between apoplastic and symplastic pathways for metal and water transport. The active water transport is modelled by Stokes equations and is defined by the pressure difference between roots and atmosphere and by the osmotic pressure in cells. The transport of metal molecules is specified by reaction-diffusion-convection equations. The ordinary differential equations describe the dynamic of metal transporter concentrations on cell membranes. Using multiscale analysis we derive a macroscopic model for transport processes defined on the scale of a whole root branch. The convergence of nonlinear terms is shown applying the unfolding method.