

## **Abstracts:**

### **Multiscale image based modelling of plant-soil interaction**

Prof. Dr. Tiina Roose (University of Southampton)

In this talk I will describe a state of the art image based model of the soil-root interactions, i.e., a quantitative, model of the rhizosphere based on fundamental scientific laws. This will be realised by a combination of X-ray CT imaging of plant-soil interaction and by integration of this morphological knowledge into a multiscale modeling framework. I will show examples about how to translate this knowledge from the single root scale to root system, field and ecosystem scale in order to enable prediction about how the climate change, different soil management strategies and plant breeding will influence the soil fertility.

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### **Optimization of Phase-Field Damage Evolution**

Prof. Dr. Winnifred Wollner (TU Darmstadt)

Within this talk, we will address optimization problems governed by time-discrete phase-field damage processes. The presence of an irreversibility of the fracture growth gives rise to a nonsmooth system of equations. To derive optimality conditions we introduce an additional regularization and show that the resulting optimization problem is well-posed.

To tackle discretization errors, as well as convergence in the limit of the irreversibility penalty, an improved differentiability result is shown for the time discrete regularized damage process.

Based upon this, we can show that certain local minimizers of the optimization problem can be approximated by the proposed penalty approach. Further, we will give a short discussion of resulting discretization error estimates.

This is joint work with R. Haller-Dintelmann, H. Meinlschmidt, M. Mohammadi, I. Neitzel, T. Wick