Investigating agricultural threats to groundwater quality and innovative solutions using vadose zone modelling

Context and objectives

Issues in pollutant transport in soils have been a focal point in soil science for the past five decades. In order to understand long-term threats to groundwater quality, a modelling approach can provide valuable insight. While detailed plot-scale transport models can provide important local information, simple and generalisable models let us consider the impacts of small-scale processes on groundwater quality across multiple climates, soil types, and crop types.

Numerical modeling can help assess the effects of agricultural practices and innovative irrigation, monitoring and fertilisation technologies and strategies. New agricultural practices may have positive impacts for groundwater quality, but we do not yet know the range of applications and extent of impacts they may have.

The project

In this project, the student will work as part of the UNINE FARMWISE team and will make use of data from one or more of the eight FARMWISE field sites across Europe. After an initial exploration period, we will choose one or more of these studies to investigate. Some of the options are: the effects of biochar on nitrate transport (Poland), reduction in water use from subsurface irrigation (Netherlands), and the impacts of low-cost biosensors on water management (Italy). Although this project is primarily numerical, travel to field sites and attendance of FARMWISE meetings around Europe may be possible given relevant opportunities and ample motivation.

Supervision and collaboration

The project will be supervised by Dr. Landon Halloran in collaboration with a postdoc (CHYN) and some of the other groups in the EU/Switzerland-funded FARMWISE project (20 partners total). Given satisfactory results, eventual publication of a journal article, co-authored by the student, is possible.

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Countries in the project
Case Studies