Geophysical Research Abstracts
Vol. 17, EGU2015-14633, 2015
EGU General Assembly 2015

Estimating water and nitrate leaching in tree crops using inverse modelled plant and soil hydraulic properties

Valentin Couvreur (1), Maziar Kandelous (1), Harmony Mairesse (2), Shahar Baram (1), Ahmad Moradi (1), Katrin Pope (2), and Jan Hopmans (1)

(1) Department of Land, Air and Water Resources, University of California Davis, United States, (2) Department of Plant Sciences, University of California Davis, United States

Groundwater quality is specifically vulnerable in irrigated agricultural lands in California and many other (semi-)arid regions of the world. The routine application of nitrogen fertilizers with irrigation water in California is likely responsible for the high nitrate concentrations in groundwater, underlying much of its main agricultural areas.

To optimize irrigation/fertigation practices, it is essential that irrigation and fertilizers are applied at the optimal concentration, place, and time to ensure maximum root uptake and minimize leaching losses to the groundwater. The applied irrigation water and dissolved fertilizer, root nitrate and water uptake interact with soil and root properties in a complex manner that cannot easily be resolved. It is therefore that coupled experimental-modelling studies are required to allow for unravelling of the relevant complexities that result from typical variations of crop properties, soil texture and layering across farmer-managed fields.

A combined field monitoring and modelling approach was developed to quantify from simple measurements the leaching of water and nitrate below the root zone. The monitored state variables are soil water content within the root zone, soil matric potential below the root zone, and nitrate concentration in the soil solution. Plant and soil properties of incremented complexity are optimized with the software HYDRUS in an inverse modelling scheme, which allows estimating leaching under constraint of hydraulic principles. Questions of optimal irrigation and fertilization timing can then be addressed using predictive results and global optimization algorithms.