**A new general 1-D vadose zone flow solution method Federico**

Fred L. Ogden, Wencong Lai, Robert C. Steinke, Jianting Zhu, Cary A. Talbot, and John L. Wilson

http://dx.doi.org/10.1002/2015WR017126

This is the main reference for the finite water-content solution developed as an efficient, converging, mass conserving and accurate alternative to Richards’ Equation. Section 3.3 is about groundwater table movement and mentions **specific yield**. Section 3.7 describes how the equations are applied in the unsaturated area to the infiltration front (in contact with land surface, gravity), falling slugs (no contact, gravity) and groundwater front (in contact with groundwater table, capillarity), in a way that conserves mass. Several equations and a couple of applications that show the goodness of the method.

**Why it matters:** this paper should connect to our use of specific yield and how we model, in a simpler way, what happens when the groundwater table moves up and down. Still unclear how we make the connection to this paper, need to retrieve SI notes, study the column paper (Ogden 2015b) and discuss with Fred.

**An explicit approach to capture diffusive effects in finite water-content method for solving vadose zone flow Federico**

Jianting Zhu, Fred L. Ogden, Wencong Lai, Xiangfeng Chen, Cary A. Talbot

<https://doi.org/10.1016/j.jhydrol.2016.01.078>

Talbot and Ogden developed the TO method to work around Richards’ Equation (Partial Differential Eq.) and model flow in unsaturated (=vadose) zone using an Ordinary Differential Eq. instead easier to solve, more feasible in hydrologic model, can use at larger, watershed scale. Here they add diffusivity to their model. They treat advection and diffusion separately (assumption, actually their effects are coupled). They find that TO+Diffusion produces more accurate water content profiles than just TO.

**Why it matters:** not very relevant, but part of the studies that seek a simple-to-solve, efficient and sufficiently accurate solution to the problem of water flowing in the soil (here unsaturated; our study neglects that, because we are more about saturated and water table oscillations). Values of sandy loam and other coarse soils might be of interest.

**See also, more important:** Ogden, F.L., Lai, W., Steinke, R.C., Zhu, J., Talbot, C.A., Wilson, J.L., 2015c. A new general 1-D vadose zone flow solution method. Water Resour. Res. 51, 4282–4300. http://dx.doi.org/10.1002/2015WR017126.

**The soil moisture velocity equation Federico**

Fred Ogden, Myron Allen, Wencong Lai, Jianting Zhu, Mookwon Seo, Craig Douglas, Cary Talbot

https://doi.org/10.1002/2017MS000931

Equation for calculating the speed of travel of discrete moisture contents in the soil.

*Neglecting the diffusion-like term resulted in slightly different wetting front profile shapes, but* ***cumulative infiltration*** *values in each case tested differed from the exact solutions by less than 1%. So, the SMVE advection-like flux term is sufficiently accurate as a replacement for the numerical solution of the one-dimensional Richards* ***equation for calculating vertical fluxes of water*** *in homogeneous soil layers.*

**Why it matters:** why does the above paper matter then?? Cite this and Ogden et al 2015 papers.

**Numerical Solution of Richards’ Equation: A Review of Advances and Challenges Federico**

Matthew W. Farthing, Fred L. Ogden

https://doi.org/10.2136/sssaj2017.02.0058

Review of the many problems of Richards’ Equation (hard to solve, varying irregular soil, variables like hydraulic conductivity in unsaturated and capillary head can change very quickly in space, large gradients, instability, does not converge, boundary conditions hard to determine in practice) and techniques used to overcome and improve solution (most important: adaptive spatial and temporal discretization, i.e. increase resolution where things change the most).

**Why it matters:** just to provide a reference for Richards’ Eq. no need to say anything.