

## Accepted Manuscript

Controls on Interactions Between Resident and Infiltrating Waters in Porous Media

P. Li, B. Berkowitz

PII: S0309-1708(18)30166-0  
DOI: <https://doi.org/10.1016/j.advwatres.2018.09.002>  
Reference: ADWR 3193



To appear in: *Advances in Water Resources*

Received date: 26 February 2018  
Revised date: 28 August 2018  
Accepted date: 2 September 2018

Please cite this article as: P. Li, B. Berkowitz, Controls on Interactions Between Resident and Infiltrating Waters in Porous Media, *Advances in Water Resources* (2018), doi: <https://doi.org/10.1016/j.advwatres.2018.09.002>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

# Controls on Interactions Between Resident and Infiltrating Waters in Porous Media<sup>☆</sup>

P. Li<sup>a,\*</sup>, B. Berkowitz<sup>a</sup>

<sup>a</sup>*Department of Earth and Planetary Sciences, Faculty of Chemistry, Weizmann Institute of Science, Rehovot, Israel*

---

## Abstract

We quantify the poorly-understood interactions between resident and infiltrating water during drainage-imbibition cycles in heterogeneous porous media, via a 2-D (and 3-D) lattice Boltzmann simulation method. These interactions are critical in the (partially saturated) soil layer, which is the interface from land surface to groundwater that controls the fate and transport of infiltrating water and chemicals to aquifers. The results demonstrate the sensitivity of these dynamic interactions to the contact angle, boundary flux condition, body force, and porosity. We show that the body force and contact angle have relatively small effects on interactions in the capillary flow regime, while the boundary flux and porosity alter the amount and distribution of resident and infiltrating water significantly. Moreover, air-water interfaces are shown to be dynamically concave/convex, determined by both contact angle and pore geometry. Our analysis demonstrates the coexistence of distinct pockets of resident and infiltrating water, and provides pore-scale, mechanistic evidence that supports field observations of soil water zones with different chemical signatures.

**Keywords:** Resident-infiltrating water interactions, drainage-imbibition cycle, lattice Boltzmann method (LBM), Shan-Chen model

---



---

<sup>☆</sup>This document is an original research paper

\*Corresponding author

Email address: [pei.li@weizmann.ac.il](mailto:pei.li@weizmann.ac.il) (P. Li)

Download English Version:

<https://daneshyari.com/en/article/10117733>

Download Persian Version:

<https://daneshyari.com/article/10117733>

[Daneshyari.com](https://daneshyari.com)