

Supplementary Figures for

# Comparison of Time Nonlocal Transport Models for Characterizing Non-Fickian Transport: From Mathematical Interpretation to Laboratory Application

Bingqing Lu <sup>1</sup>, Yong Zhang <sup>1,2\*</sup>, Chunmiao Zheng <sup>3</sup>, Christopher T. Green <sup>4</sup>, Charles O'Neill <sup>5</sup>, Hong-Guang Sun <sup>2</sup>, and Jiazhong Qian <sup>6</sup>

<sup>1</sup> Department of Geological Sciences, University of Alabama, Tuscaloosa, AL 35487, USA; blu5@crimson.ua.edu

<sup>2</sup> Department of Engineering Mechanics, Hohai University, Nanjing, Jiangsu 210098, China; yzhang264@ua.edu

<sup>3</sup> School of Environmental Science & Engineering, Southern University of Science and Technology, Shenzhen, Guangzhou 518055, China; zhengcm@sustc.edu.cn

<sup>4</sup> U. S. Geological Survey, Menlo Park, CA 94025, USA; ctgreen@usgs.gov

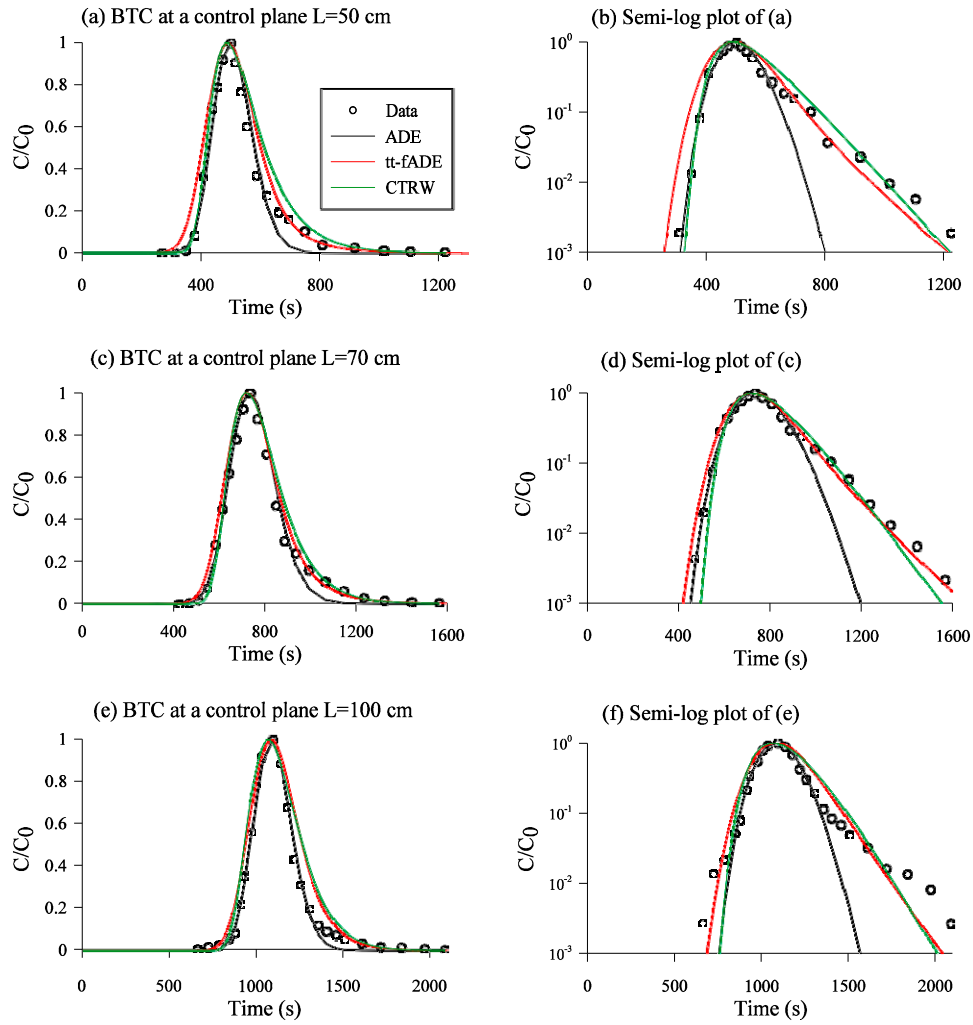
<sup>5</sup> Department of Aerospace Engineering and Mechanics, University of Alabama, Tuscaloosa, AL 35487, USA; croneill@eng.ua.edu

<sup>6</sup> School of Resources and Environmental Engineering, Hefei University of Technology, Hefei 230009, China; qianjiazhong@hfut.edu.cn

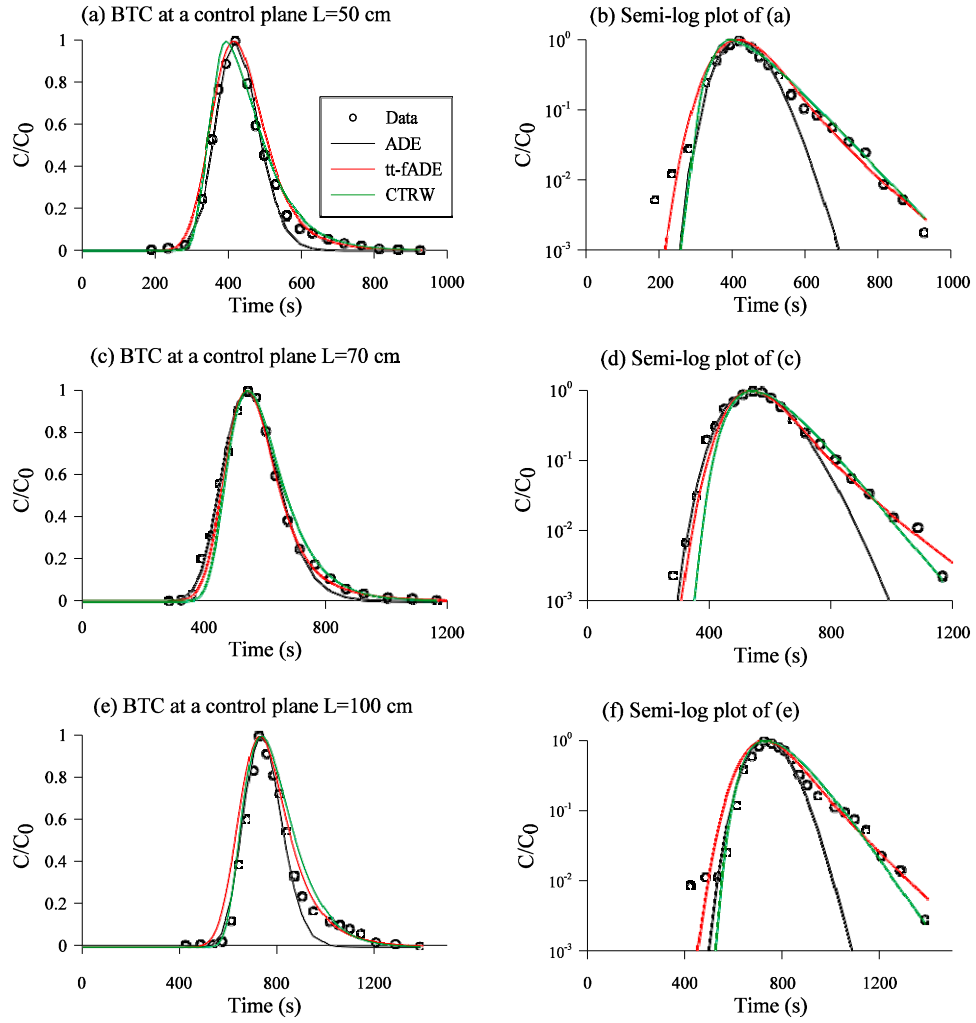
\* Correspondence: yzhang264@ua.edu; Tel.: +01-205-348-3317

Manuscript submitted to *Water*

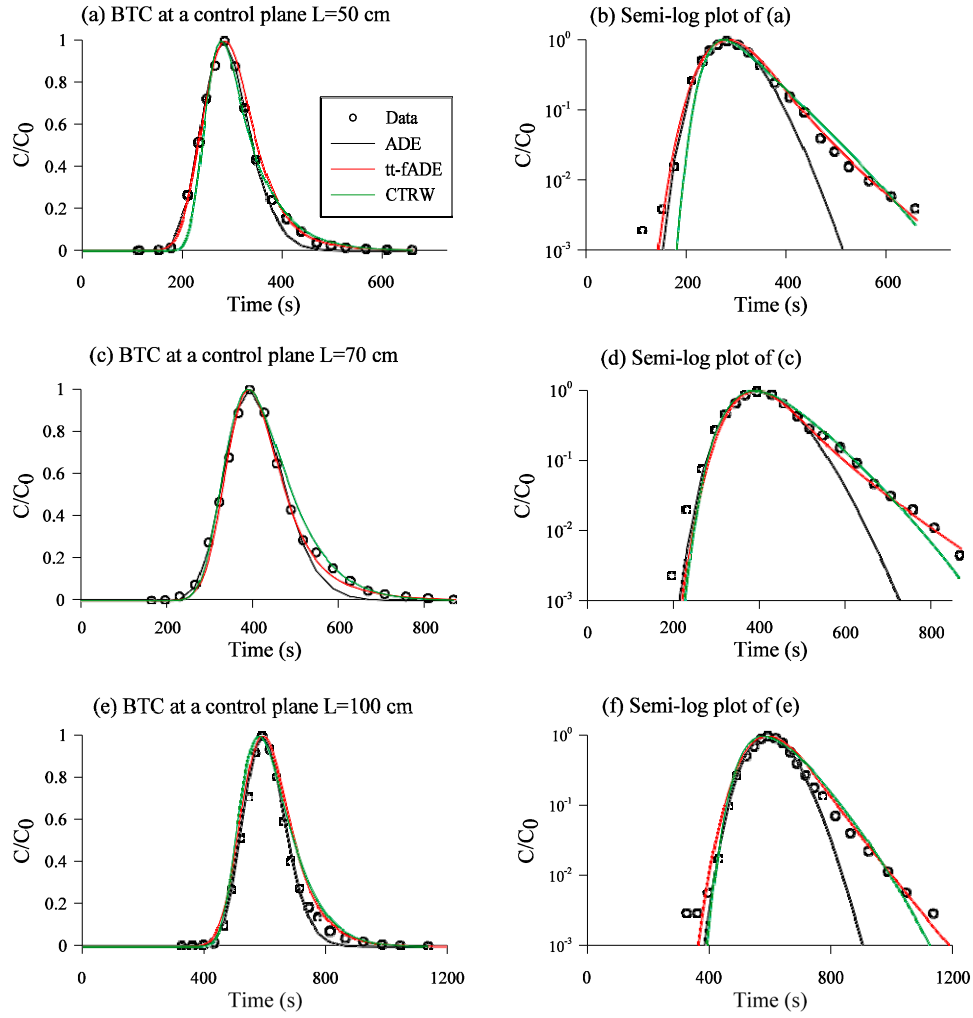
This file includes: Figures S1 to S10



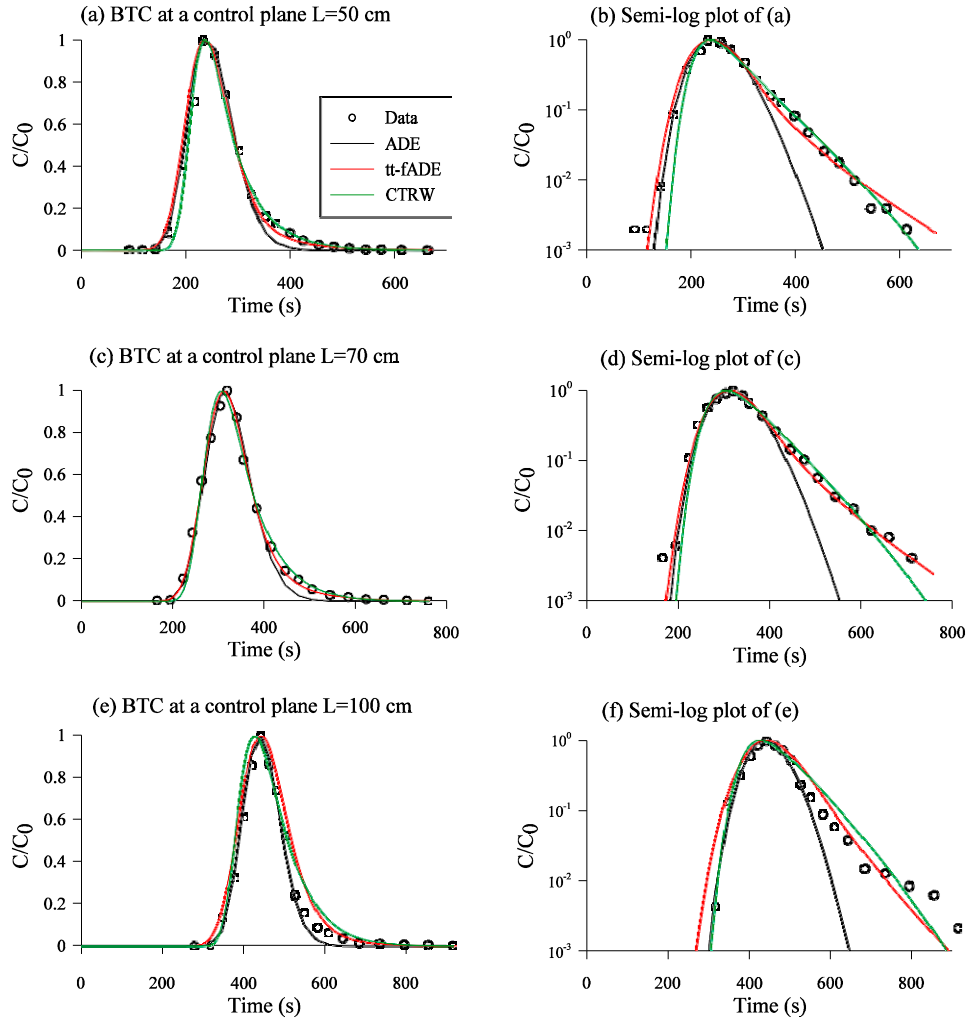
**Figure S1.** Comparison between the measured (symbols) and modeled (lines) breakthrough curves (BTCs) using the ADE model (black line), the tt-fADE model (red line) and the CTRW model (green line) with the experimental water flow rate  $Q = 0.4$  mL/s.



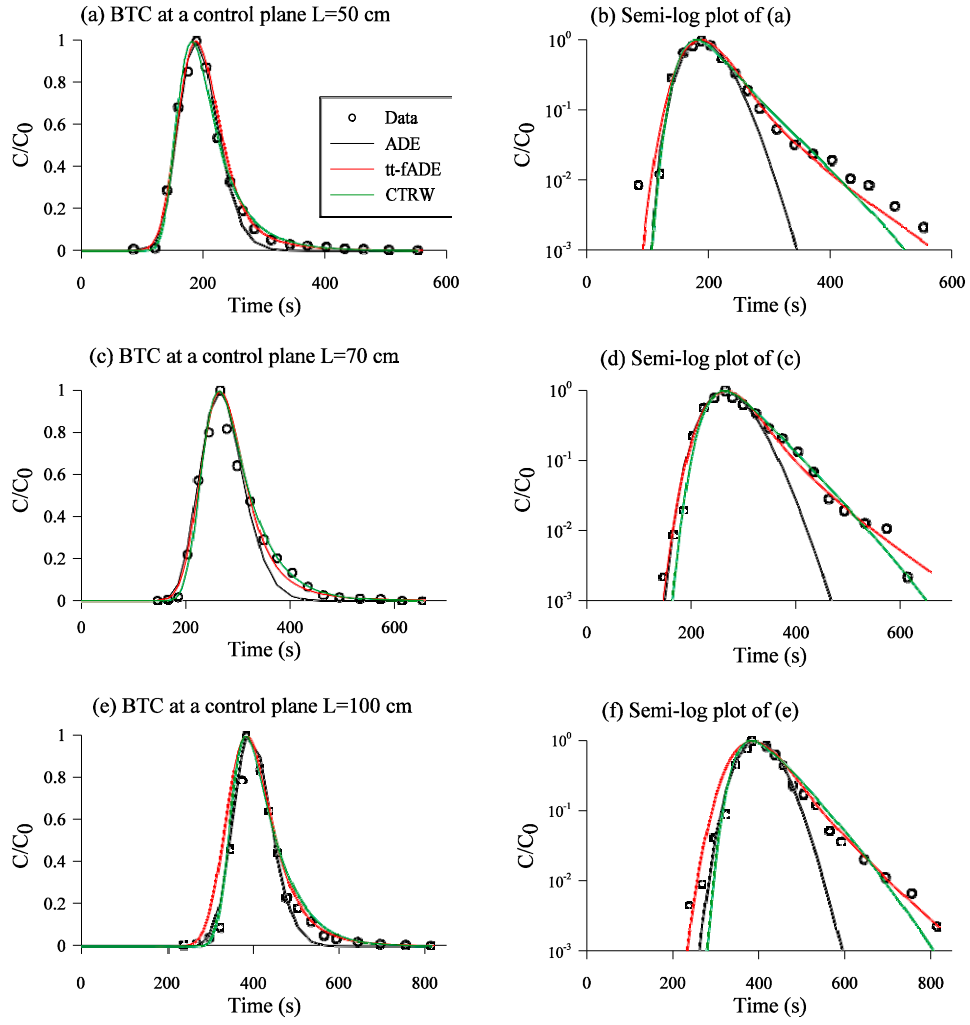
**Figure S2.** Comparison between the measured (symbols) and modeled (lines) breakthrough curves (BTCs) using the ADE model (black line), the tt-fADE model (red line) and the CTRW model (green line) with the experimental water flow rate  $Q = 0.6$  mL/s.



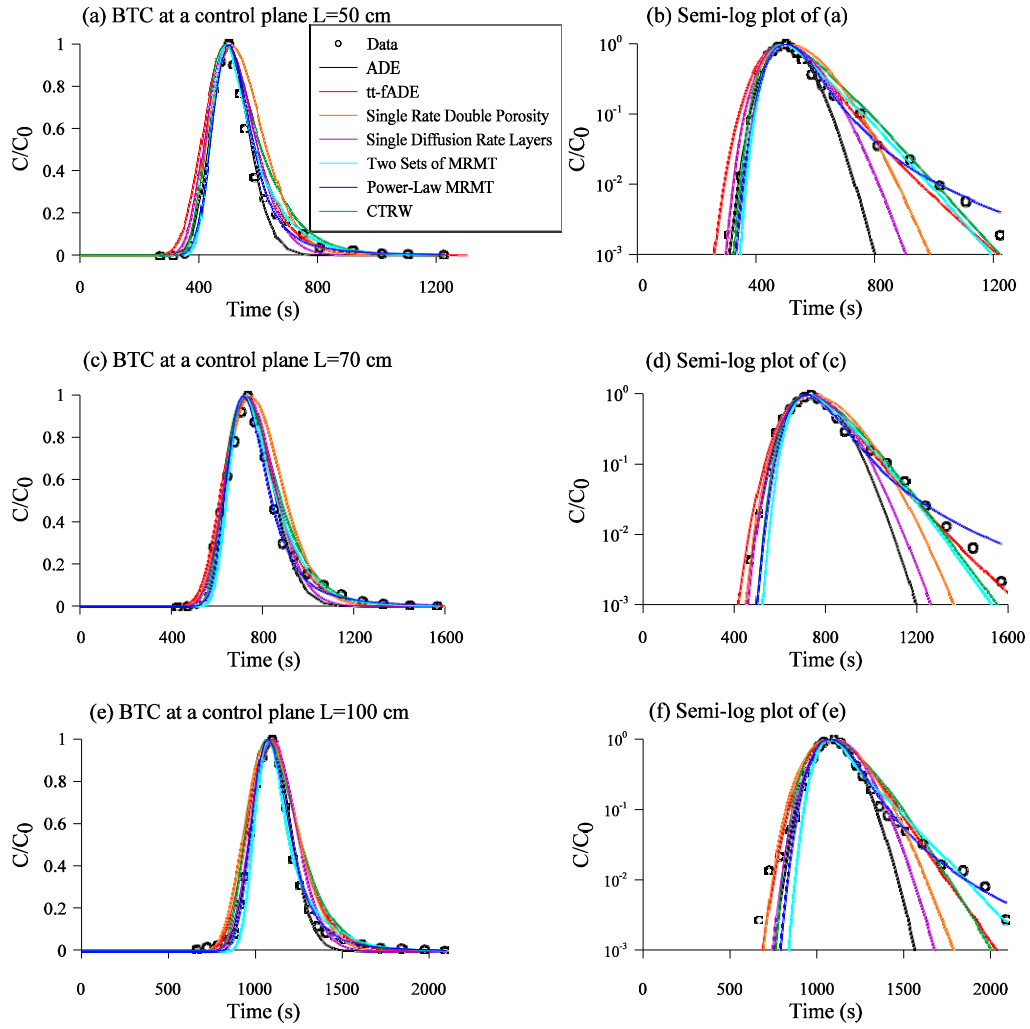
**Figure S3.** Comparison between the measured (symbols) and modeled (lines) breakthrough curves (BTCs) using the ADE model (black line), the tt-fADE model (red line) and the CTRW model (green line) with the experimental water flow rate  $Q = 0.8$  mL/s.



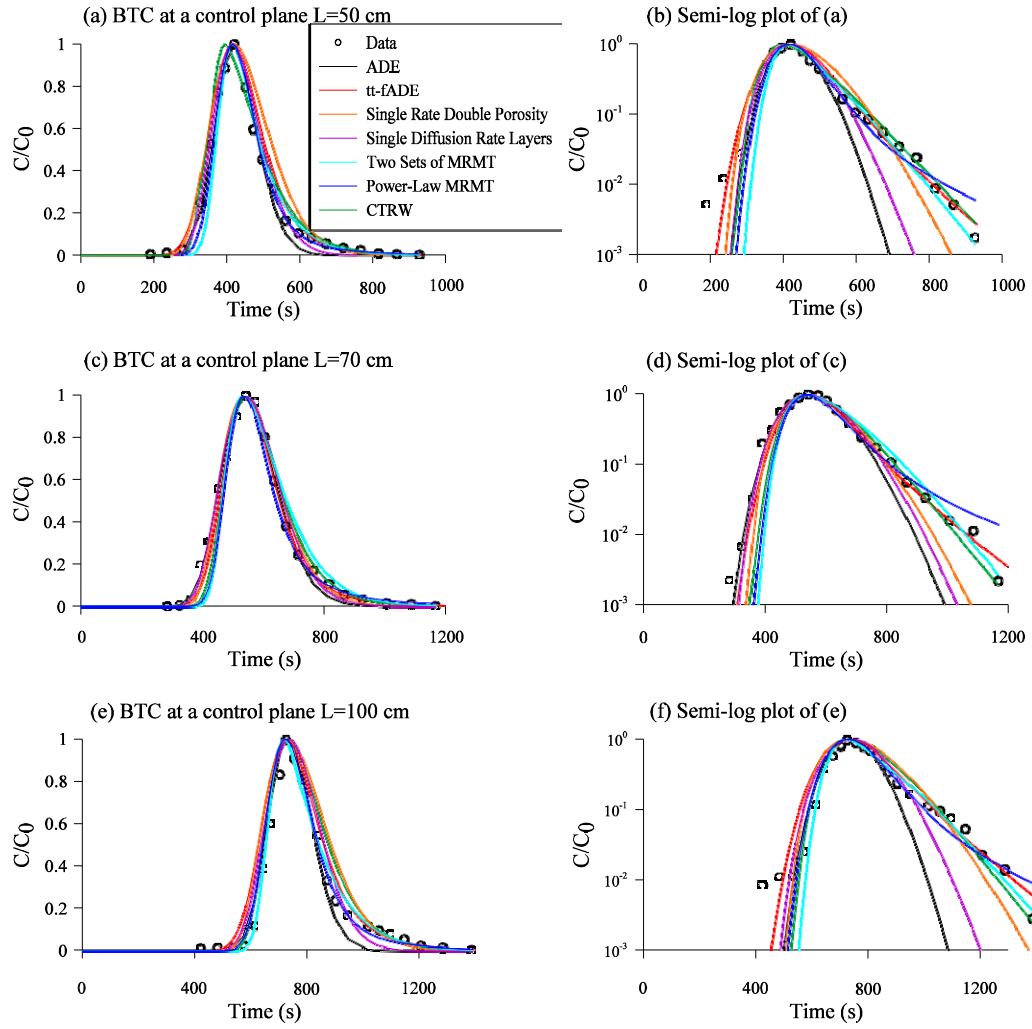
**Figure S4.** Comparison between the measured (symbols) and modeled (lines) breakthrough curves (BTCs) using the ADE model (black line), the tt-fADE model (red line) and the CTRW model (green line) with the experimental water flow rate  $Q = 1.0$  mL/s.



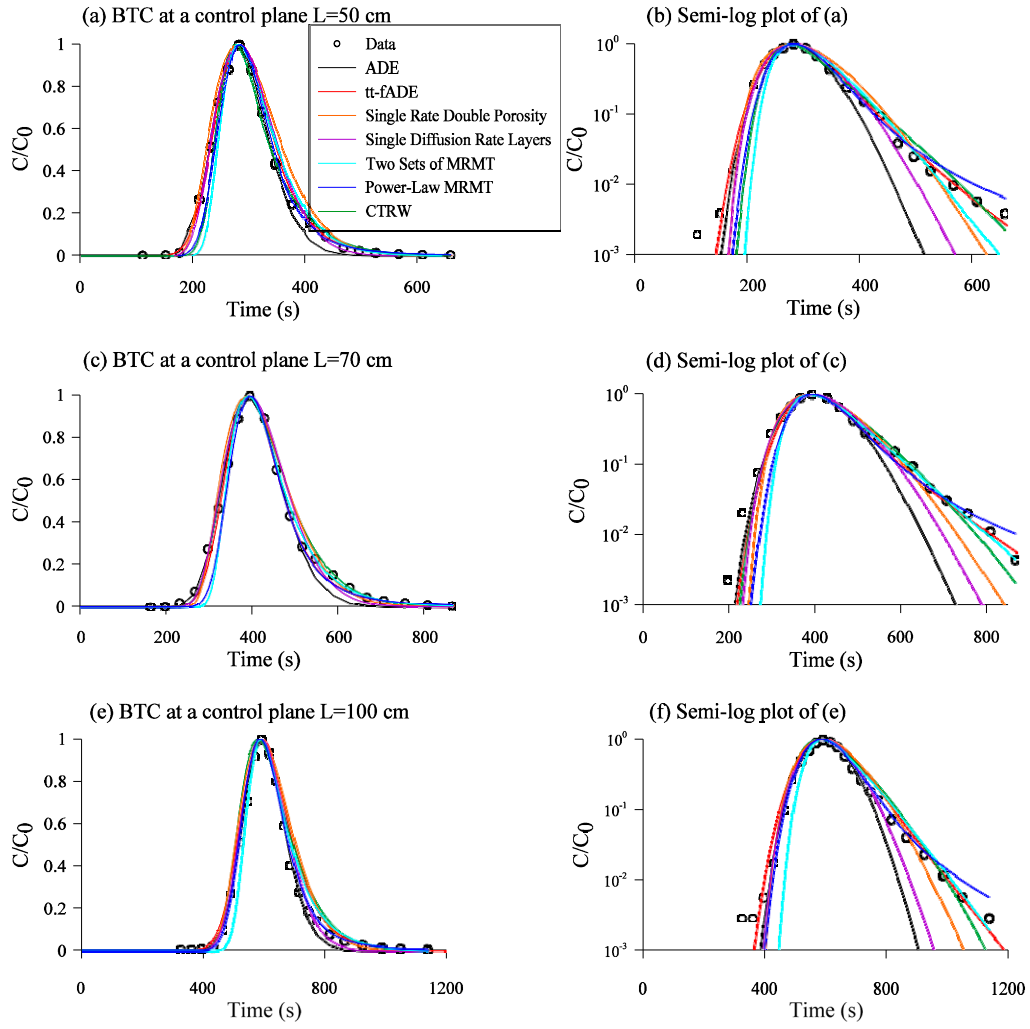
**Figure S5.** Comparison between the measured (symbols) and modeled (lines) breakthrough curves (BTCs) using the ADE model (black line), the tt-fADE model (red line) and the CTRW model (green line) with the experimental water flow rate  $Q = 1.2$  mL/s.



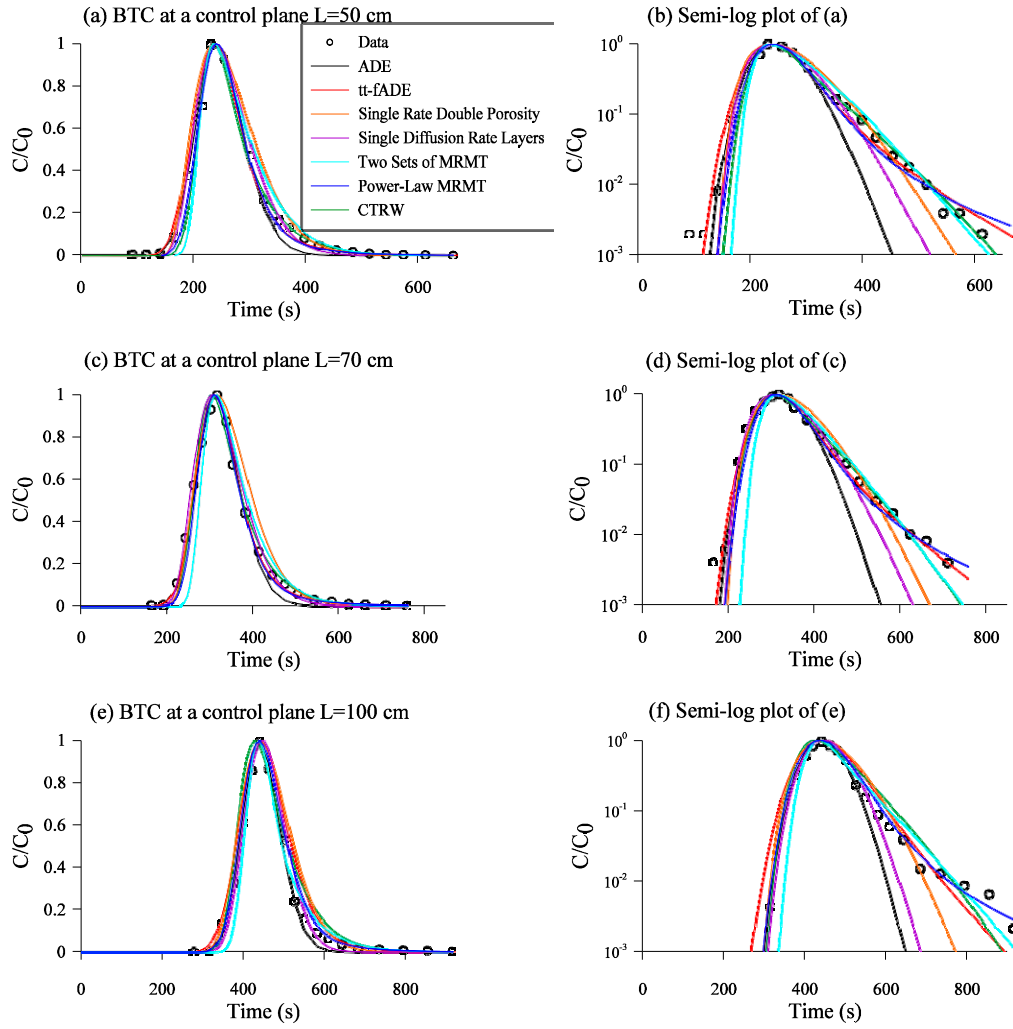
**Figure S6.** Comparison between the measured (symbols) and the modeled (lines) breakthrough curves (BTCs) using the ADE, the tt-fADE, the MRMT, and the CTRW models with the water flow rate  $Q = 0.4$  mL/s.



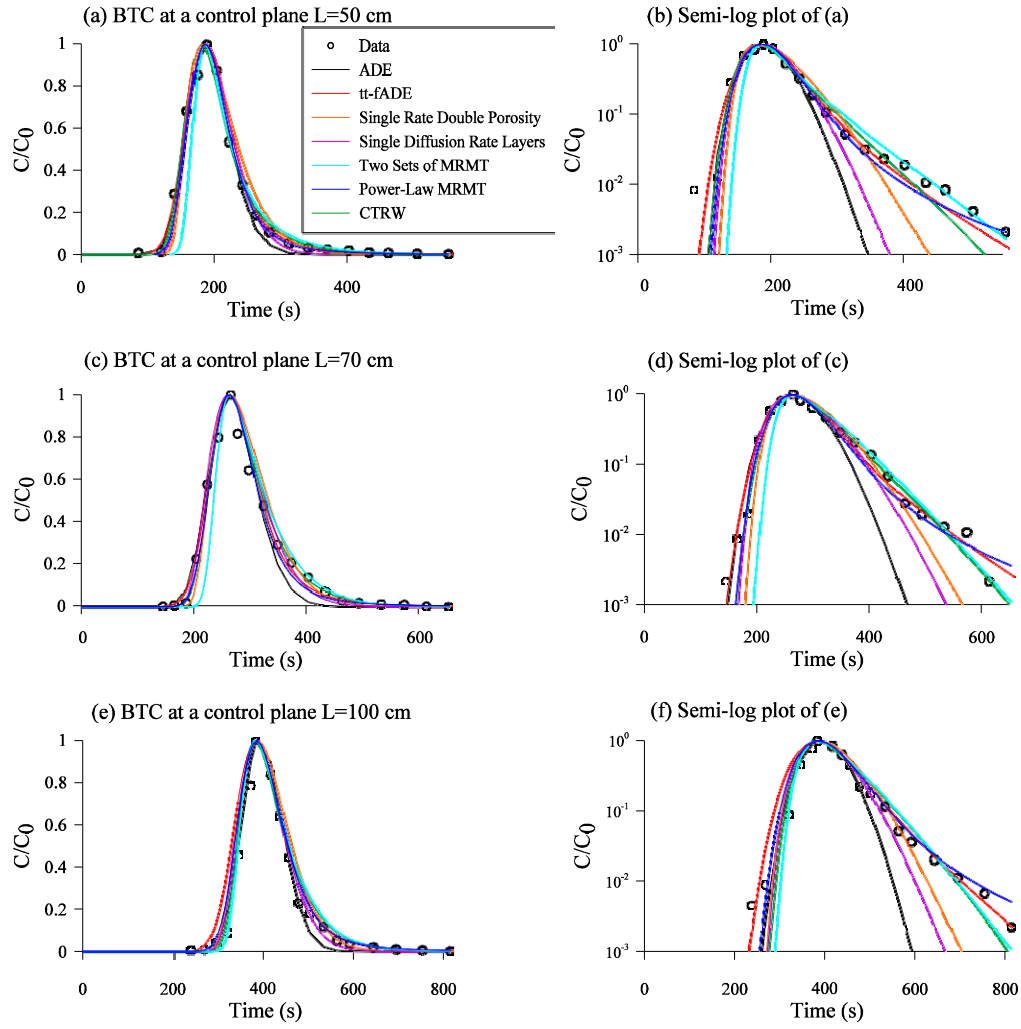
**Figure S7.** Comparison between the measured (symbols) and the modeled (lines) breakthrough curves (BTCs) using the ADE, the tt-fADE, the MRMT, and the CTRW models with the water flow rate  $Q = 0.6$  mL/s.



**Figure S8.** Comparison between the measured (symbols) and the modeled (lines) breakthrough curves (BTCs) using the ADE, the tt-fADE, the MRMT, and the CTRW models with the water flow rate  $Q = 0.8$  mL/s.



**Figure S9.** Comparison between the measured (symbols) and the modeled (lines) breakthrough curves (BTCs) using the ADE, the tt-fADE, the MRMT, and the CTRW models with the water flow rate  $Q = 1.0$  mL/s.



**Figure S10.** Comparison between the measured (symbols) and the modeled (lines) breakthrough curves (BTCs) using the ADE, the tt-fADE, the MRMT, and the CTRW models with the water flow rate  $Q = 1.2$  mL/s.