A two-stage procedure for determining unsaturated hydraulic characteristics using a syringe pump and outflow observations - DTU Orbit (27/12/2018)

A two-stage procedure for determining unsaturated hydraulic characteristics using a syringe pump and outflow observations

A fast two-stage methodology for determining unsaturated flow characteristics is presented. The procedure builds on direct measurement of the retention characteristic using a syringe pump technique, combined with inverse estimation of the hydraulic conductivity characteristic based on one-step outflow experiments. The direct measurements are obtained with a commercial syringe pump, which continuously withdraws fluid from a soil sample at a very low and accurate how rate, thus providing the water content in the soil sample. The retention curve is then established by simultaneously monitoring the capillary pressure. The measured retention curves were compared with those obtained by static methods and found to agree closely. Subsequently, a transient outflow experiment is carried out on the same soil sample, in the same apparatus, and the information is obtained on a time-scale of days. The one-step outflow data and the independently measured retention data are included in the objective function of a traditional least-squares minimization routine, providing unique estimates of the unsaturated hydraulic characteristics by means of numerical inversion of Richards equation. As opposed to what is often assumed in practical applications, we found it necessary to allow the exponent (gamma) of van Genuchten's hydraulic conductivity expression to vary to obtain satisfactory estimates. Optimized hydraulic conductivity estimates were ultimately compared with directly measured values, and visual agreement was quite satisfactory. However, we encountered numerical instabilities of the optimization code used (SFIT), a flaw that may constitute a potential problem when using this code for the optimization.

General information
State: Published
Organisations: Department of Hydrodynamics and Water Resources, University of Colorado Boulder
Pages: 347-359
Publication date: 1997
Peer-reviewed: Yes

Publication information
Journal: Soil Science Society of America Journal
Volume: 61
Issue number: 2
ISSN (Print): 0361-5995
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 2.21 SJR 0.997 SNIP 1.056
Web of Science (2017): Impact factor 1.92
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.13 SJR 0.931 SNIP 1.072
Web of Science (2016): Impact factor 1.844
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.02 SJR 1.118 SNIP 1.109
Web of Science (2015): Impact factor 1.752
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.12 SJR 1.071 SNIP 1.268
Web of Science (2014): Impact factor 1.721
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.24 SJR 1.268 SNIP 1.245
Web of Science (2013): Impact factor 2
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 2.12 SJR 1.399 SNIP 1.292
Web of Science (2012): Impact factor 1.821
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
Scopus rating (2011): CiteScore 2.26 SJR 1.5 SNIP 1.4
Web of Science (2011): Impact factor 1.979
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.432 SNIP 1.314
Web of Science (2010): Impact factor 1.866
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.685 SNIP 1.618
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.851 SNIP 1.591
Scopus rating (2007): SJR 1.646 SNIP 1.725
Scopus rating (2006): SJR 1.561 SNIP 1.601
Scopus rating (2005): SJR 1.905 SNIP 1.887
Scopus rating (2004): SJR 1.625 SNIP 1.708
Scopus rating (2003): SJR 1.34 SNIP 1.528
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.551 SNIP 1.58
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.553 SNIP 1.491
Scopus rating (2000): SJR 2.119 SNIP 1.658
Scopus rating (1999): SJR 2.077 SNIP 2.062
Original language: English
Source: orbit
Source-ID: 168459
Research output: Research - peer-review | Journal article – Annual report year: 1997