Permeability Estimation Directly From Logging-While-Drilling Induced Polarization Data - DTU Orbit (24/12/2018)

Permeability Estimation Directly From Logging-While-Drilling Induced Polarization Data

In this study we present the prediction of permeability from time-domain spectral induced polarization (IP) data, measured in boreholes on undisturbed formations using the El-log logging-while-drilling technique. We collected El-log data and hydraulic properties on unconsolidated Quaternary and Miocene deposits in boreholes at three locations at a field site in Denmark, characterized by different electrical water conductivity and chemistry. The high vertical resolution of the El-log technique matches the lithological variability at the site, minimizing ambiguity in the interpretation originating from resolution issues. The permeability values were computed from IP data using a laboratory-derived empirical relationship presented in a recent study for saturated unconsolidated sediments, without any further calibration. A very good correlation, within one order of magnitude, was found between the IP-derived permeability estimates and those derived using grain size analyses and slug-tests, with similar depth-trends and permeability contrasts. Furthermore, the effect of water conductivity on the IP-derived permeability estimations was found negligible in comparison to the permeability uncertainties estimated from the inversion and the laboratory-derived empirical relationship.

General information
State: Published
Organisations: Department of Environmental Engineering, Environmental Fate & Effect of Chemicals, Aarhus University, TU Braunschweig
Pages: 2851-2870
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: Water Resources Research
Volume: 54
Issue number: 4
ISSN (Print): 0043-1397
Ratings:
  BFI (2018): BFI-level 2
  Web of Science (2018): Indexed yes
  BFI (2017): BFI-level 2
  Scopus rating (2017): CiteScore 4.39 SJR 2.296 SNIP 1.555
  Web of Science (2017): Impact factor 4.361
  Web of Science (2017): Indexed yes
  BFI (2016): BFI-level 2
  Scopus rating (2016): CiteScore 4.1 SJR 2.615 SNIP 1.633
  Web of Science (2016): Impact factor 4.397
  Web of Science (2016): Indexed yes
  BFI (2015): BFI-level 2
  Scopus rating (2015): CiteScore 4.06 SJR 2.525 SNIP 1.593
  Web of Science (2015): Impact factor 3.792
  Web of Science (2015): Indexed yes
  BFI (2014): BFI-level 2
  Scopus rating (2014): CiteScore 3.75 SJR 2.442 SNIP 1.668
  Web of Science (2014): Impact factor 3.549
  Web of Science (2014): Indexed yes
  BFI (2013): BFI-level 2
  Scopus rating (2013): CiteScore 3.65 SJR 2.204 SNIP 1.751
  Web of Science (2013): Impact factor 3.709
  ISI indexed (2013): ISI indexed yes
  Web of Science (2013): Indexed yes
  BFI (2012): BFI-level 2
  Scopus rating (2012): CiteScore 3.12 SJR 2.127 SNIP 1.586
  Web of Science (2012): Impact factor 3.149
  ISI indexed (2012): ISI indexed yes
  Web of Science (2012): Indexed yes