Geophysical Research Abstracts
Vol. 12, EGU2010-15261, 2010
EGU General Assembly 2010

Time series analyses of gas-bubble residence time in porous media

Detlef Lazik, Gunnar Krauss, Helmut Geistlinger, and Hans-Jörg Vogel
Helmholtz Centre for Environmental Research (UFZ), Leipzig - Halle, Germany

Gas injection into coarse, water saturated sediments results in buoyancy driven bubble movement between an incoherent more or less stable trapped gas phase. The quantitative understanding of the coupled processes resulting in entrapment and movement of the incoherent gas phase allows for optimizing the interaction of trapped and moving gas clusters during air sparging. For granular media with particles larger than 4 mm gas flow becomes continuous without entrapment of large gas clusters. For particles smaller than 1 mm channeling flow is observed. For intermediate particle sizes the gas phase moves within buoyancy driven bubbles between entrapped clusters.

To analyze this phenomena we designed a 2D flow cell filled with 2 mm glass beads. The total gas saturation could be measured gravimetrically at high temporal resolution. Gas was injected close to the lower boundary where the volume of injected gas bubbles could be controlled between 10 cm^3 and 5000 cm^3. This was achieved by changing the size of a reservoir attached to the injection point in which the gas pressure was increased until the air-enty point of the porous medium was reached and the gas cluster was relesed. The pressure of the reservoir was monitored to detect the frequncy of injected gas bubbles.

Based on these data the mean and variance of traveltimes could be reliabely determined. The measurements are related to the bulk material and are not restricted to optical observations at the container wall. Thus our method can be applied to any type of sample containment. Nevertheless, the results are in agreement with additional optical measurements obtained at the transparent cell wall. We found that the mean traveltimes are the same irrespective the size of injected bubbles however the variance depends on bubble size in a non-liner manner. In conclusion we discuss the possibility to control the interaction between injected and trapped gas through the injected bubble size.