Geophysical Research Abstracts
Vol. 19, EGU2017-7101, 2017
EGU General Assembly 2017

Observed dependence of colloid detachment on the concentration of initially attached colloids and collector surface heterogeneity in porous media

Tiantian Li (1), Yan Jin (2), and Chongyang Shen (1)

(1) Department of Soil and Water Sciences, China Agricultural University, Beijing, China (chongyang.shen@cau.edu.cn), (2) Department of Plant and Soil Sciences, University of Delaware, Newark DE, United States (yjin@udel.edu)

Sand column experiments were conducted to examine effects of concentration of attached colloids (CAC) on their subsequent detachment upon decreasing solution ionic strength (IS). Different pore volumes of latex microparticle suspension were injected into the columns to allow different amounts of colloids to attach at ISs of 0.001, 0.01, and 0.2 M, respectively. Then deionized water was introduced to release the attached colloids. Results show that the fraction of attachments that were reversible to reduction of IS (FRA) increased with increasing CAC at a given IS if the sand were extensively treated using acids to remove surface charge heterogeneity. This indicates that colloids were preferentially immobilized in sites favoring irreversible attachment, and then gradually occupied reversible sites. In contrast, the FRA decreased with increasing CAC at 0.001 M in sand without the acid treatment, illustrating the opposite attachment sequence. Scanning electron microscope examinations reveal that the concave regions favored irreversible colloid attachment. Reversible attachment is likely due to immobilization in stagnation point regions via secondary minima association in the acid-treated sand and capture of colloids by protruding asperities with charge heterogeneity in the untreated sand. At ISs of 0.01 and 0.2 M, the FRA was essentially independent of CAC in the untreated sand because the colloids were randomly attached on the sand surfaces with time elapse.