Geophysical Research Abstracts
Vol. 19, EGU2017-18508, 2017
EGU General Assembly 2017

Relationships between Root-induced Biopores and Preferential Flow in Forest in Rocky Mountainous Area of Northern China

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Root-induced biopores in forest soil is one of major types pathways for preferential flow. In this study, we focused on characterizing root-induced biopores in forest soil and exploring their contribution on preferential flow. Two types of forest were selected, one is broad - leaved mixed forest, which mainly contains Quercus variabilis, and the other type was coniferous mixed forest with Platycladus orientalis (L.) Franco. Root-induced biopores with all diameter in vertical and horizontal profiles were recorded and quantified per unit surface area along soil depth. Meanwhile, endoscopy was put inside the biopores which cannot distinguished by external form to take photos and videos of internal situation. Monolith method and tracer experiments were combined to estimate root length density and distinguish roots which have positive effects on preferential flow. Our results showed that: The major type of biopores in study areas was the root-induced biopores. Roots in biopores with no root hairs were loose and few contact with pore walls. The density of root-induced biopores had effects on preferential flow. The high density always induced more stained area and promoted more water to go through especially in the layer of 0-10 cm. Besides, the connectivity between adjacent soil layers was also an important role in the layer of 10-30 cm. Not all root-induced biopores had positive effects on water infiltration, even in the soil layer of 0-10 cm. In BMF, roots with diameter in the class of $0.0<d<0.5$ mm contributed to majority of preferential flow, while in CMF, roots with other diameter-class made more contribution on water infiltration.