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## **Transient behavior of arsenic in vadose zone under alternating wet and dry conditions: A comparative soil column study**

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### **Abstract:**

The water and oxygen contents of the vadose zone change cyclically depending upon the meteorological condition (e.g., intermittent rainfall), which can affect the biogeochemical reactions that govern the fate of arsenic (As). To simulate and evaluate the transient behavior of As in this zone when subjected to repeated wet and dry conditions, soil column experiments with different soil properties were conducted. Three wetting–drying cycles resulted in the fluctuation of water and dissolved oxygen contents, and consequently, the reduction–oxidation potential in the soil columns. Under these circumstances, the biotic reduction of As(V) to As(III) was observed, especially in the column filled with soils enriched in organic matter. Most of the As was found to be associated with soil particles rather than to be dissolved in the pore water in all of the columns tested. Retention of As was more preferable in the soil column with a higher Fe content and bulk density, which provided more sorption sites and reaction time, respectively. However, a considerable amount of soil-bound As could be remobilized and released back to the pore water with the repetition of wetting and drying due to the transformation of As(V) to As(III).

Keywords: vadose zone, arsenic, wetting-drying cycle, redox sensitive behavior, soil column experiment