The Effect of Surface Lithology on Arsenic in Surface Water and Groundwater in Mustang Valley, Nepal Himalaya

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Abstract. Elevated levels of groundwater As in the Ganges River floodplain have been well-documented. Recent studies have shown that elevated groundwater As occurs even in Kathmandu and Pokhara Valleys in Nepal Himalaya, which are far upstream of the Ganges floodplain. Studies in both valleys showed surface water As to be statistically indistinguishable from groundwater As, which led to the fluvial recharge model in which elevated groundwater As results from losing streams with elevated As, which is a consequence of rapid erosion caused by a combination of monsoon climate, tectonic uplift, deforestation and rangeland degradation. The objective of this study was to further test the fluvial recharge model in Mustang Valley in Nepal Himalaya. Water samples were collected from 33 surface water sites and 24 groundwater sites. The WHO As Standard (As = 0.01 mg/L) was exceeded in 47% of surface water samples and 79% of groundwater samples. Separating samples into a high-As Region I (37 sites with geometric mean As = 0.071 mg/L and maximum As = 0.848 mg/L) and a low-As Region II (20 sites with undetectable As for 85% of samples and maximum As = 0.004 mg/L) showed that surface water As (geometric mean As = 0.056 mg/L in Region I) and groundwater As (geometric mean As = 0.087 mg/L in Region I) were statistically indistinguishable within each region. Only Region I receives overland flow from the exposed Mustang and Mugu Granites. The correspondence between groundwater As and watershed surface lithology is further evidence for the fluvial recharge model.