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The Relationship between Trace Elements in Groundwater Linked to a History of Volcanic Activity in La Pampa and Buenos Aires Provinces, Argentina

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Abstract : Volcanic and geothermal activity can result in the release of arsenic (As), manganese (Mn), iron, selenium (Se), molybdenum (Mo) and uranium (U) into natural waters. Several studies have reported high levels of these elements in surface and groundwater in Argentina. The main focus has been on As associated with volcanic ash deposits. This study reports the trace element levels of groundwater from an agricultural region of south-eastern La Pampa and southern Buenos Aires provinces, Argentina which have reported high levels of human health problems (bone/teeth disorders, depression, arthritis, etc). Fifty-eight groundwater samples were collected from wells adjacent to Ruta 35 and an Agilent 7700x inductively coupled plasma mass spectrometer (ICP-MS) were used for total elemental analysis. Physicochemical analysis confirmed pH range of 7.05-8.84 and variable conductivity (988-3880 µS/cm) with total dissolved solid content of 502-1989 mg/l. The majority water samples are in an oxidizing environment (Eh= 45-146 mV). Total As levels ranged from (µg/l): 13.08 – 319.4 for La Pampa (LP) and 39.6 – 189.4 for Buenos Aires (BA); all above the WHO Guideline for Drinking Water, 10 µg/l As. Interestingly, Mo (LP: 1.85 – 85.39 µg/l; BA: 4.61– 55.55 µg/l;), Se (LP: 1.2 – 16.59 µg/l; BA: 0.3– 6.94 µg/l;) and U (LP: 1.85 – 85.39 µg/l; BA: 4.61– 55.55 µg/l;) levels are lower than reported values for northern La Pampa. Inter-elemental correlation displayed positive statistically significant between As-Mo, A-Se, As-U while negative statistically significant between As-Mn and As-Fe. This confirms that the source of the trace element is similar to that reported for other region of Argentina, namely volcanic ash deposition.

Keywords : Argentina, groundwater, trace element, volcanic activity
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