Argon isotope anomalies in lavas

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A common assumption in K-Ar and $^{40}Ar/^{39}Ar$ geochronology applied to volcanic rocks is that they equilibrate isotopically with atmospheric Ar. Several early studies [1, 2] suggested occasional violations of this assumption. Further work [3-5] on historic Japanese and Hawaiian lavas revealed common departures from atmospheric values, typically involving correlated subatmospheric $^{40}Ar/^{36}Ar$ and $^{38}Ar/^{36}Ar$ with some scatter towards supra-atmospheric $^{40}Ar/^{36}Ar$. This work, along with new data recently reported by us [6, 7], indicate that non-atmospheric initial Ar isotope ratios are common in volcanic rocks, and reflect two partially competing mechanisms: 1) retention of mantle and/or crustally derived ^{40}Ar-rich Ar; and 2) incomplete isotopic equilibration with atmospheric Ar inducing correlated $^{40}Ar/^{36}Ar$ and $^{38}Ar/^{36}Ar$ due to kinetic fractionation (KF) [8]. Samples dominated by KF tend to be isotopically light, suggesting a net flux of Ar from atmosphere into the melt or lava. Supra-atmospheric $^{40}Ar/^{36}Ar$ and $^{38}Ar/^{36}Ar$ values on the KF trend occur in some natural samples with high ^{36}Ar concentrations, and can be induced in some laboratory heating/quenching experiments. The most fractionated Ar isotopes observed are in obsidians, for which we measure $^{40}Ar/^{36}Ar$ and $^{38}Ar/^{36}Ar$ as low as –10% and –4% (respectively) relative to atmospheric Ar [9]. Field and laboratory experiments are underway to further clarify the scope and mechanisms of initial Ar isotope variations in volcanic rocks. Meanwhile, the assumption of initially isotopically atmospheric Ar in low-radiogenic samples should be evaluated e.g. by analyzing $^{38}Ar/^{36}Ar$ in unirradiated and unspiked (with ^{38}Ar) aliquots.

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Impact of urban stormwater on sediment quality in an enclosed bay of the Lule River, northern Sweden

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Sediment samples and porewater of an enclosed bay (*Skutviken*) affected by stormwater discharge near the centre of Luleå, northern Sweden, were analyzed for major and trace elements and 16 polycyclic aromatic hydrocarbons (PAHs), and compared to a reference site and local till. Among the studied metals, Cd, Cu, Pb and Zn were enriched at *Skutviken*. The use of trace metal ratios provided indications of pollutant sources for the sediment. Also, the PAH content was enriched, in particular for phenantrene, anthracene, fluoranthene and pyrene, which are regarded as common constituents in stormwater. Pb-210 dating was used to determine historical changes in metal and PAH fixation in the sediment. The bay *Skutviken* was enclosed by the construction of a road bank in 1962. The enclosure led to reduced water circulation in the bay, which promoted the occurrence of anoxic conditions with sulphate reduction within the bay. As a consequence of these conditions, metals are trapped in the sediments as sulphides.

This study suggests that enclosed bays with restricted water circulation may be efficient traps for urban pollutants. In areas with postglacial rebound, where such bays are common, enclosure may have an important impact on water and sediment qualities.

Due to the postglacial uplift, presently water covered sediments may rise above the groundwater level in the future. These sediments may then become a secondary pollution source if metal sulphides are oxidized.