

Use of ^{26}Al and Accelerator Mass Spectrometry to study Al geochemistry in Acid Sulfate Soils

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Despite the abundance of aluminium in released waters, current understanding of Al geochemistry in acid sulfate soils (ASS) has been restricted due to the difficulty to study its speciation with generally available laboratory instrumentation. Reactive, or, exchangeable Al is an environmentally significant fraction of Al as it can leach into the soil solution and be released into adjacent water bodies. This study aimed at investigating the exchangeability of Al in ASS using isotopic exchange experiments and extraction procedures.

While isotope exchange experiments are common in soil science, the use of ^{26}Al as a tracer and analysis by accelerator mass spectrometry (AMS) is a novel method [1] [2]. The general methodology employed for the isotope exchange experiments involved suspending soil samples in Milli-Q water and then spiking with an appropriate quantity of ^{26}Al in the form of $^{26}\text{AlCl}_3$. Samples were allowed to equilibrate and aliquots of the supernatant were analysed for changes in ^{27}Al and ^{26}Al concentrations, by ICP OES and AMS respectively. Isotope exchange data was compared to more 'conventional' extractions used for the estimation of exchangeable Al in soils: 1M KCl and 0.2M CuCl_2 [3] [4] [5].

The results showed that the pool of Al extracted by 1M KCl and 0.2M CuCl_2 was significantly lower than the isotopically exchangeable Al, especially in organic matter (OM)-rich soils. Also, as opposed to what is usually observed in ASS, Al exchangeability increased with pH and showed a strong correlation with dissolved organic matter (DOM).

Isotopic exchange with ^{26}Al seems to be a useful tool to estimate exchangeable Al in ASS but also to evaluate the current methodology used to estimate Al in ASS.

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