# GEMAS results at a regional scale: the Alps

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The GEMAS project involved the sampling and analysis of agricultural and grazing land soil over Europe at a sample density of 1 sample per 2500 $Km^2$. Among the complete database we selected the samples collected in the alpine mountain range partially exceeding the border of the Alpine convention and considering important geographic boundaries as the Rhone rive to the West, the Danube river to the North and the Po River course to the South as major boundaries for sample selection.

We worked either on the total chemical content derived from XRF analysis and on the Aqua Regia data set for a total of 132 sites of grazing land soils and 119 sites for agricultural soil.

The analysis of the data set indicate minor differences between the two soil types. There is a clear control of bedrock geology, even if sample density is too low for the complex geology of the alpine mountain range. There are numerous several point anomalies for single elements associated either to known important mining areas or minor mineralizations or to various kinds of anthropogenic contributions. There are few sites with multi element anomaly in South Tyrol (Ag, Cd, Pb, Zn) located close to a well known mining area, and Slovenia. There are also extensive anomalies covering large area as displayed for example by As that between Switzerland and Italy displays a strong anomaly, important even on a continental scale [1], and recognized also in other matrices such as bottled mineral waters [2]. Also uranium shows a large anomalous area between in the central Alps between Austria and South Tyrol, related to mineralization.

[1] Tarvainen *et al*.. (2013) *Applied Geochemistry* **28**, 2-10.
[2] Birke & Reimann (2010) *Geochemistry of european bottled water*, Borntraeger

# Anthropogenic sulfate in the atmosphere decrease the carbon uptake by karst in rural area of SW, China

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Sulfuric acid as a weathering agent has been recognized recently as not only enhancing weathering but also lowering $CO_2$ consumption rates. However, the impact of sulfuric deposition on carbonate weathering is still poorly explored, with most studies mainly focussed on large rivers that generally integrate over a number of processes and often average the situation from various backgrounds. In this study, we investigated the chemical compositions of rainwater and stream water of a karstic rural catchment located in Huanjiang County, Guagxi Province, SW of China to understand the impact of the atmospheric anthropogenic sulfate on carbon uptake by karst at rural area. The results showed that the sum of concentrations of $Ca^{2+}$ and $Mg^{2+}$ ($[Ca^{2+}+ Mg^{2+}]$) of stream water were in excess with respect to $HCO_3^-$ ($[HCO_3^-]$), with a mean $[Ca^{2+}+ Mg^{2+}]/[HCO_3^-]$ ratio of 1.1. Sulfate acid accounted for the excess of $Mg^{2+}$ and $Ca^{2+}$ relative to $HCO_3^-$. The involvement of sulfuric acid in carbonate weathering caused about 6.5% increase of weathering rates, and meanwhile 14.8% decrease of the $CO_2$ consumption rates, of which the involvement of atmospheric anthropogenic sulfate accounted for about 9.6%. The data available at present indicate that even in the rural karst region of southwest China, the involvement of anthropogenic sulfate can largely decrease the carbon uptake rate by carbonate weathering.

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