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A glimpse of the Anthropocene captured by environmental tracers in the groundwater of a fractured aquifer

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The Anthropocene is an epoch in Earth's history that has been proposed to characterise the global impact of human activities on the Earth's atmosphere, biosphere, hydrosphere, geosphere, i.e. the Critical Zone.

Just as for past climates, the signature of these anthropogenic impacts are recorded by environmental tracers dissolved in groundwater that could provide a better understanding of groundwater flows, residence time and mixing thus providing information on this major water resource both in terms of quantity and quality.

In this study, we use dissolved gases (CFCs, SF₆, ⁴He, ¹⁴C, noble gases and VOCs) and groundwater chemical composition as environmental tracers to unveil insights of the Anthropocene in a fractured aquifer in the northwest of France. We analyse the impact of groundwater abstraction on residence time and excess air composition. We evidence the influence of climate change through recharge temperature. We also quantify the appearance of anthropogenic compounds over the last decades.

These observations enable us to define precisely the anthropogenic limits and distribution within groundwater and thus to gain a better picture of the groundwater resource resilience potential in the future.