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Combined investigations on long-term hydrochemical monitoring and high frequency measurements in the Critical Zone from the Auradé catchment (SW, France)

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The Critical Zone (CZ) is now well identified as the land-atmosphere interface under the influence of many human pressures rendering up vulnerable for future generations. Although many investigations have been undergone over the last 30 years in the different compartments of the CZ, it remains important to understand the overall functioning of this area in a context of global change.

A long-term hydrological and chemical monitoring was performed since 30 years for nitrates and discharge, and for 10 years for major elements at the stream outlet of a small agricultural carbonated catchment (Auradé site). This catchment is part of the observatories network OZCAR infrastructure and since 1992 it was a pilot for improving agricultural practices. Two time scales were investigated based on a discrete sampling during low water flow and hydrological events, and since 2006 on high frequency datas (every 10mn) for pH, conductivity, nitrate, temperature... using a multiparameter probe.

The long-term trends indicated mostly a decreasing in nitrate, Ca and Mg concentrations namely and an increase in DOC, which can be related to the influence of the environmental practices (fertilizers inputs, vegetative filter strip etc.), but more recently to the changes in temperature and hydrological patterns (decreasing discharge and occurrence of rare but intensive events). The high frequency measurements on short-term events allowed: (i) to highlight the mechanisms involved in flux exportations (nycthemeral cycle for nitrates as ex.), (ii) to reconstruct the chemical patterns by correlating the parameters to major elements, and finally (iii) to have a better and more precise approach of the contribution of weathering and land use on the hydrochemical functioning of the CZ, particularly on the disturbance of carbon cycle by anthropogenic fingerprints.