

Chemical mass budgets at the Brie Critical Zone Observatory, France

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The Orgeval catchment (45 km²) is a French Critical Zone Observatory, part of the RBV (“Réseau des bassins versants”) network. It is a representative temperate agricultural catchment that have been monitored for the last 50 years for water discharge and water table variations by IRSTEA. The geology consists of a typical sedimentary basin of Cenozoic age with horizontal layers of limestones, silcrete and marls. Two main aquifers are present within the catchment: the Brie and the Champigny aquifers. Orgeval catchment is one of instrumented catchments of the CRITEX program and is the locus of a multidisciplinary approach. Agricultural inputs and land use are also monitored making Orgeval an ideal basin to test the response of the Critical Zone to agricultural forcing [1].

In the paper, we report a bimonthly sampling of Orgeval catchment at both upstream and downstream location. Rainwaters, aquifers, seepage waters, fertilizers and rock were also sampled and analyzed. Major and trace elements, as well as Sr isotopes in the dissolved load were measured during one hydrological cycle, between August 2013 and January 2015.

Coupled with hydrological chronicles and fertilizer data, our data allows us to trace the major sources of solutes to the river, to constrain the mass budget of each major element in the basin, and to calculate long-term weathering rates. The two main contributions to the river solutes appear to be rainwater and agriculture inputs. 26% of the Na at the outlet the basin is of rainwater origin. Sr isotopic ratios appear to be a good tracer to estimate the contribution of deepwaters to surface waters. Concentration vs. discharge relationships allow us to estimate chemical weathering rates integrated over 20 years.

Overall, the geochemistry of the Orgeval CZO show that a precise knowledge of element budgets at the catchment scale is critical for predicting the evolution of the CZ in agricultural catchment in the next centuries.

[1] J. Garnier et al. (2104) *Journal of Environmental Management*. **144**, 125- 134.