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Use of natural organic matter fluorescence to illustrate transit time differences in the unsaturated zone of karst hydrosystems. Application to the Low-Noise Underground Laboratory (LSBB) of Rustrel, Pays d'Apt, in France

Thursday 9 June 2022 11:00 (20 minutes)

Karst aquifers contribute significantly to water supply. Sustainable management of karst water resources requires a good understanding of karst recharge processes. Most karst aquifers are fastly reacting systems, in which short transit times (0 to 6 months) are common. However, few natural tracers are usable in this time range. In a recent work currently under review (Serene et al., 2022), we showed that natural organic matter fluorescence has the potential for being a natural tracer of short time range. Identified main fluorescent compounds of karst groundwater from the Fontaine de Vaucluse hydrosystem are humic-like and three different protein-like (P1, Trp and Tyr). These compounds have different degradation rates, so their relative concentration is related to transit time.
In this study, we consider the temporal dynamics of fluorescent natural organic matter at 3 temporary (C, AJ and W) and 3 perennial (A, B, and D) flow points from the LSBB. Correlations between compounds are used to shed light on water dynamics of these flow points. High correlation coefficients between all fluorescent compounds suggest a short transit time. Longer transit time yields a correlation between Trp and P1 only, because of their similar degradation rate. If the transit time is even longer, correlation between Trp and P1 may be lost. Indeed, initial concentration of P1 is generally lower and it may reach detection limits. Compared with mean, maximum and minimum values, the results of these correlation coefficients put in releaf the difference of storage conditions and transit time for the different types of flows. Thus, fluorescence of organic matter appears to be a highly sensitive indicator, providing complementary results to other natural tracers.

Ewald, M., Berger, P., Visser, S.A.: UV-visible absorption and fluorescence properties of fulvic acids of microbial origin as functions of their molecular weights, Geoderma 43, 11–20, https://doi.org/10.1016/0016-7061(88)90051-1, 1988.
Serène, L., Batiot-Guilhe, C., Mazzilli, N., Emblanch, C., Babic, M., Dupont, J., Simler, R., Blanc, M., and Massonnat, G.: Transit Time index (TTi) as an adaptation of humification index to illustrate transit time differences in karst hydrosystems. Application to the karst springs of Fontaine de Vaucluse system (Southeastern France), Hydrol. Earth Syst. Sci. Discuss. [preprint], https://doi.org/10.5194/hess-2022-100, in review, 2022.

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