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Modeling the redox potential during the infiltration in a recharge pond located in the Llobregat river basin

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Redox potential measurements are a sink of multiple processes and factors related to the hydrochemistry of a water. Normally, by themselves, they do not provide enough information to describe all the processes occurring in a system and they are considered only as “an indicator” that combined with a more detailed hydrochemistry can provide information of the driving processes. There are different reasons why these measurement are not quantitatively valid. First of all, sampling plays an important role. The most common method to determine Eh in groundwater is by using an Eh probe and a cell flow, which implies, by itself, mixing of waters. On the other hand, the Eh reproducibility is also conditioned by the amount of processes considered in a numerical model. Eh depends on several geochemical processes, which at the same time, they are depending on flow and heat transport. The last achievements in sensing science has allowed to develop sensor probes that allows the Eh measurements in a non-invasive and a continuous way.

Considering this, in this work we have monitored intensively an infiltration pond (in the context of Managed Aquifer Recharge) in order to develop a proper model to reproduce the Eh. The monitoring was based in the use of non-invasive Eh probes, which registered the Eh every 15 min during a year. During that year, four hydrochemical campaigns were also developed in order to quantify the hydrochemistry of the site. On the other hand, the model considered the flow of the system, the heat transport and a set of geochemical processes which were also depending on temperature. The main processes were the generation of organic matter in the own system, the oxidation of organic carbon using different TEAPs, nitrification and different secondary geochemical processes related, specially, to iron and manganese geochemistry.