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Identifying and Quantifying transient groundwater fluxes and fluxes of contaminated sources of recharge into complex groundwater reservoir by Mixing Cells Modeling approach.

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Groundwater reservoirs are rarely isolated. Usually production aquifers are affected by hydraulically connected to neighboring sub-aquifers units and nearby water baring formations with different water qualities and dissolved mineral contents. These results long term special and temporal variations in groundwater quality of production aquifers. Phreatic aquifers are prone to on-surface anthropogenic activities, although it is clear that even confined aquifers are negatively affected down the years by percolation of contaminants that gradually percolate into groundwater reservoirs over the recharge area. Even massive groundwater abstraction reveals almost a steady flow system after several years. However the differential fluxes from neighboring sub-aquifers attracted into the production aquifer cause long-term temporal distribution of the groundwater quality. The main issue is how to firmly identify the hydraulic connectivity among the various sub aquifers, and to draw the solid pathways among the connected active water bearing units. Beyond that, these processes often prevail under announcing a non-steady aquifers environment as function of massive groundwater abstraction. This results gradual yet substantial spatial and temporal variations in chemical and dissolved minerals distribution, all which suggest on transient flow and mass transport distribution. For such complex aquifers system, where the hydrologic conditions along the boundaries cannot be well-defined, the transient Mixing Cells Modeling approach MCMusf (unsteady flow) is proposed to illuminate on the active flow paths and to assess the transient groundwater fluxes within the aquifer.
The presentation will elaborate on the mathematical set up of the newly developed MCMusf code for transient flow system, and on a feasible solution which is based on linear optimization scheme.