



DFG-funded CAWR project (TUD/IGW and UFZ/MET) to evaluate opportunities and limitations of an environmentally friendly tracer approach based on stable isotope analysis and electrical conductivity measurement

*Rationale:*

- naturally occurring differences in the stable isotope signature and ion strength between storm waters (rain and snowmelt) and groundwaters are used to actively trace injection waters in porous media
- stable isotopes of water are transported almost conservatively through aquifer systems and can be used as “ideal” tracer substances

*Aims:*

- detailed analysis of deuterium and oxygen-18 isotope transport in porous media under variable subsurface conditions
- assessment of interactions between injected storm water, groundwater and aquifer material (ion and isotope exchange and fractionation processes)
- assessment of the influence of isotope analysis precision on estimated transport parameter quality with and without consideration of dynamic mixing processes



*Tracer test with 1000 liters of snowmelt at the groundwater test site in Pirna, Saxony*



### *Methods:*

- laboratory scale batch and column experiments to investigate the isotopic and ionic stability and the actual transport behaviour of storm waters in porous media
- numerical modelling of laboratory setups (esp. geochemical interactions → PhreeqC and PHT3D) to quantify processes and to plan these experiments
- tracer experiments at the groundwater test site in Pirna, Saxony to transfer laboratory findings to a field-scale system (controlled and direct injection of rain water or snowmelt to the subsurface → photograph)
- long-time monitoring of field parameters (isotope signatures, EC values, ...) to analyze natural fluctuations

### *CAWR synthesis:*

- IGW → Prof. Dr. Rudolf Liedl and Dr.-Ing. Diana Burghardt → expertise in analytical and numerical modeling and laboratory experiments, focus on stable isotope analysis and hydrogeochemical interactions
- MET → Prof. Dr. Peter Dietrich → expertise in hydrogeological exploration, focus on tracer experiments at field scale

### *Partner:*

- Prof. Dr. Henning Prommer, CSIRO [Commonwealth Scientific and Industrial Research Organization] in Perth, WA, Australia → expertise in advanced reactive modelling & model development