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A long-term experiment to decipher the critical role of surface-depth interfaces

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Water flow shapes ecosystems in many ways: the multiplicity of water flow paths, at the surface and in the subsurface, converging and mixing to interfaces, have a central role in the emergence of hotpots, key factors for the functioning of biogeochemical cycles. As an example, the hyporheic zone is one of the most reactive zones that have been heavily studied. However, the natural high heterogeneity of geological layers naturally favor the mixing between different water, creating subsurface and surface hotpots
The GUIDEL project consists in working on the deep interactions that connect the different components of a 1 km3 ecosystem (4 km2 at the surface) and understand the processes that regulate them, through an experimental approach. The Guidel Observatory (SNO-SOERE H + Ploemeur) will be destabilized by a large-scale AEP pumping. This will completely reorganize flow structures, at depth and surface, stimulate water mixing and generate large transient signals describing the convergence towards a new geophysical, geochemical and ecological equilibrium over a wide range of time scales. This physical action will increase water stress and profoundly destabilize the ecosystem, and will provide insights into the inter-relations between the lithosphere, hydrosphere and biosphere to better understand the resilience of ecosystems to climate change. We highlight the main (first) challenge, which is to define the initial state, its variability though the results of the first experiments.