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Drilling the centre of the Thuringian Basin, Germany, to decipher potential interrelation between shallow and deep fluid systems

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To shed light on the coupled dynamics of near surface and deep fluids in a sedimentary basin on various scales, ranging from the pore scale to the extent of an entire basin, is of paramount importance to understand the functioning of sedimentary basins fluid systems and therefore e.g. drinking water supply. It is also the fundamental goal of INFLUINS (INtegrated FLuid dynamics IN Sedimentary basins), a research initiative of several groups from Friedrich-Schiller University of Jena and their partners. This research association is focusing on the nearby Thuringian basin, a well confined, small intra-continental sedimentary basin in Germany, as a natural geo laboratory. In a multidisciplinary approach, embracing different fields of geophysics like seismic reflection profiling or airborne geomagnetics, structural geology, sedimentology, hydrogeology, hydrochemistry and hydrology, remote sensing, microbiology and mineralogy, among others, and including both, field-based, laboratory-based and computer-based research, an integral INFLUINS topic is the potential interaction of aquifers within the basin and at its rims. The Thuringian basin, which is composed of sedimentary rocks from the latest Paleozoic and mainly Triassic, is particularly suited to undertake such research as it is of relative small size, about 50 to 100 km, easily accessible, and quite well known from previous studies, and therefore also a perfect candidate for deep drilling.

After the acquisition of 76 km seismic reflection data in spring 2011, to get as much relevant data as possible from a deep drilling at the cross point between two seismic profiles with a limited financial budget, an optimated core sampling and measuring strategy including partial coring, borehole geophysics and pump tests as well as a drill hole design, which enables for later continuation of drilling down to the basement, had been developed. Drilling Triassic rocks from Keuper to lower Buntsandstein was successfully realised down to a final depth of 1179 m from late June to mid-September 2013. Here, we give an introduction into the layout of INFLUINS deep drilling together with a summary of preliminary results, e.g. on the nature of the boundaries between Muschelkalk and Buntsandstein, and between upper and middle Buntsandstein, a complete core recovery of upper Buntsandstein saliniferous formations as well as unexpectedly low porosity and permeability of potential aquifers.