

EGU25-4438, updated on 06 Nov 2025

<https://doi.org/10.5194/egusphere-egu25-4438>

EGU General Assembly 2025

© Author(s) 2025. This work is distributed under

the Creative Commons Attribution 4.0 License.



## Historic buildings under the impact of climate change: insights from geoelectric field monitoring

**Wiebke Lehmann**, Lukas Römhild, Wolfgang Gossel, and Peter Bayer

Martin-Luther University Halle-Wittenberg, Institute of Geosciences and Geography, Applied Geology, Halle (Saale), Germany (wiebke.lehmann@geo.uni-halle.de)

Extreme weather events driven by climate change, such as floods and droughts, are damaging the structural stability of historic buildings in Central Germany by causing moisture retention and soil desiccation. The alternating wet and dry periods lead to cracks in walls and subsidence from falling groundwater levels. Understanding the impact of these conditions on regional groundwater dynamics and building materials is crucial as droughts and floods are expected to increase in the coming years.

As part of this study, three geoelectric field campaigns with a total of 17 profiles are being carried out between April 2024 and April 2025 at five different field sites of monuments in the federal states of Saxony and Saxony-Anhalt. For investigating seasonal and weather-dependent fluctuations in groundwater conditions, transient trends are observed by repeated electrical resistivity tomography (ERT) measurements. These provide insights into hydrological changes in the subsoil, and thus information on how weather events can affect different layers of the soil as well as foundation structures. In addition to the geoelectrical investigations, 14 groundwater wells are being drilled to a depth of around 10 m to monitor the fluctuations in the groundwater level over time. Furthermore, complementary laboratory tests are being conducted to characterize the soil properties, allowing a reliable interpretation of the ERT inversion results.

Preliminary results indicate that layers down to 25 m depth can be affected by weather-dependent variations in resistivity, depending on the hydraulic properties of the soil material at the respective site. Despite the elevated precipitation during the summer months of June and July, the topsoil underwent significant drying by November 2024, leading to a reduction in the groundwater level and subsequent saturation of the deeper soil layers. Ongoing continuous measurements shall provide further insights.