An innovative temperature monitoring approach to ensure the sustainable use of shallow geothermal energy on quarter scale

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26.05.2022

EASyQuart

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Supported by:

Federal Ministry for Economic Affairs and Climate Action

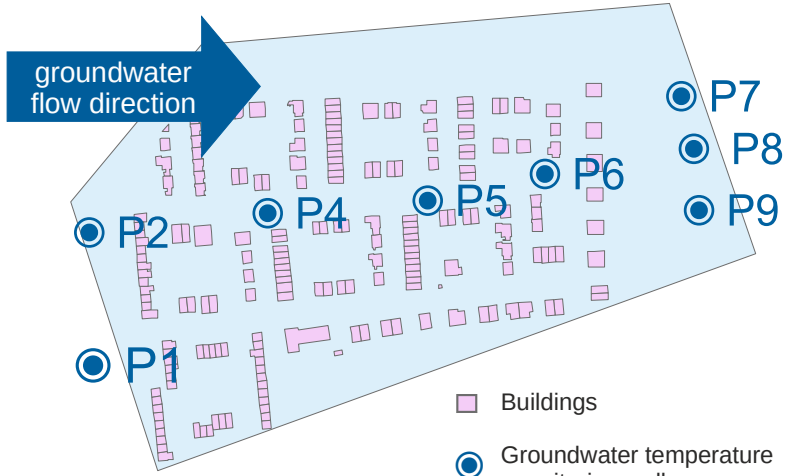
on the basis of a decision by the German Bundestag

Study area

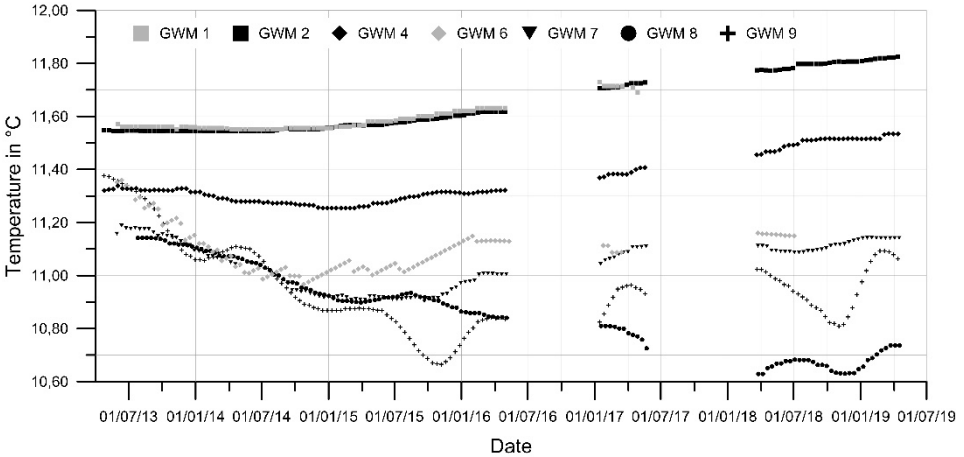
- Quarter with a building stock of 150 houses in Cologne, partly heated with geothermal energy
- Start of intensive thermal usage of the shallow subsurface for first buildings in 2010
- Measurement of groundwater temperatures since 2013

➢ **How would groundwater temperatures be without geothermal usage?**

➢ **What is the impact of buildings on the underground temperature regime?**

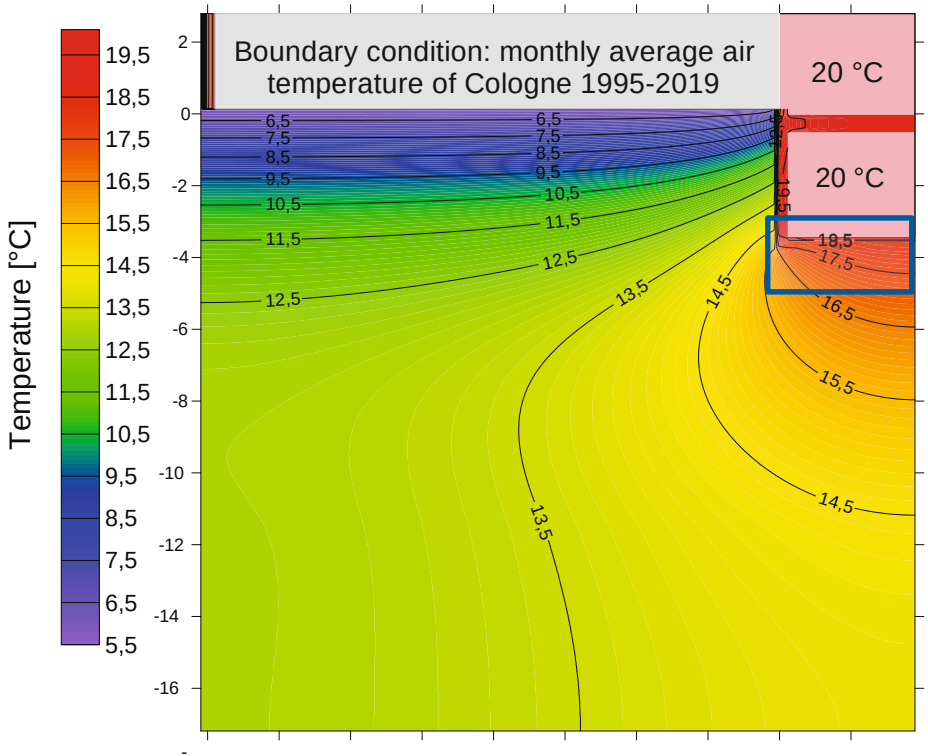


Overview study area (N. Hastreiter)



Measured groundwater temperatures (modified after Vienken et al. 2019, DOI: 10.1186/s40517-019-0123-x)

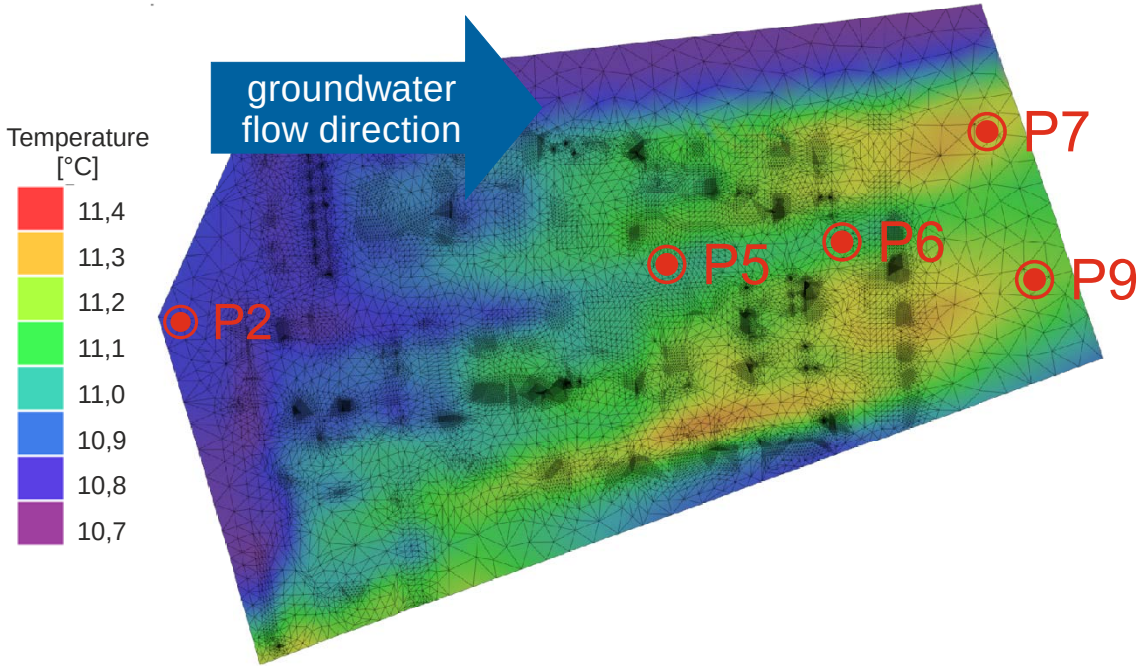
Building physics simulation to determine heat input from houses into subsurface



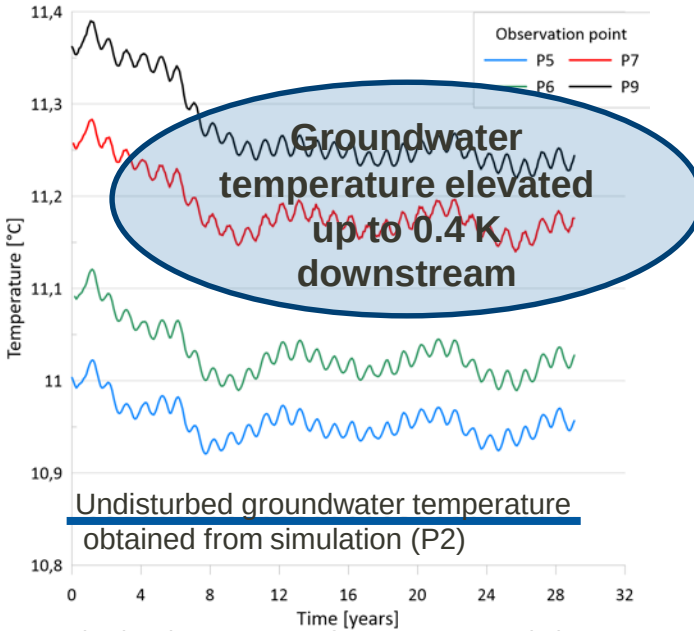
Result for buldings physics simulation with a heated basement of medium insulation standard (N. Hastreiter)

- Implemented for common building insulation standards and heated or unheated basements
- Dynamic temperature boundary conditions below the buildings are implemented into a heat and groundwater flow model

Coupling building physics simulation results with Feflow model of heat and groundwater flow



Simulated temperature distribution after 30 years 24 m bgl (N. Hastreiter)



Simulated temperature after 30 years 24 m bgl (N. Hastreiter)

- **Shown approach enables a better understanding and quantification of local underground heat island formation and it's effects on measured groundwater temperatures**

Thank you very much for your attention!

For further information please refer to

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