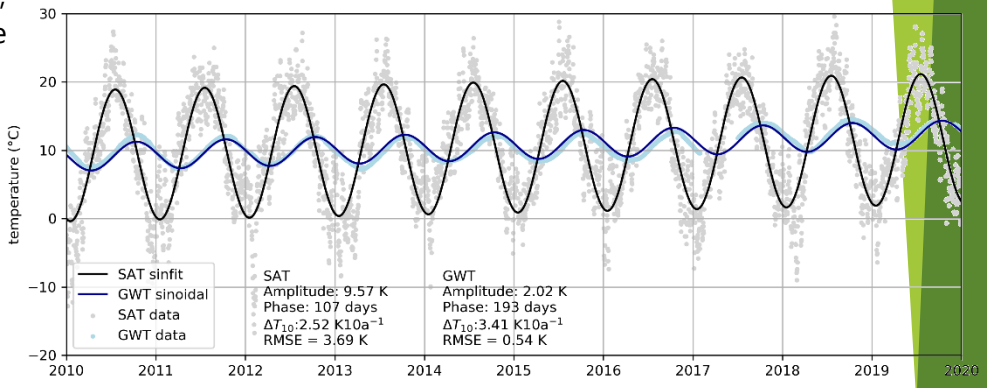
Call for BSc/MSc Thesis

Applied Geology
University of Halle-Wittenberg

Using groundwater temperature time series to quantify surface-subsurface heat fluxes

About

Groundwater temperature records have been scarce in the last centuries due to the lack of availability of cheap sensors and the awareness of importance of heat transfers within the shallow subsurface. Modern water level loggers also record groundwater temperature, which opens the opportunity to deduce the information inherent in these time series. This thesis topic aims at developing a model of the shallow subsurface that precisely quantifies local heat fluxes in the shallow subsurface by tying together atmospheric, land-surface, soil and groundwater temperature time series. Such a model could be used to project atmospheric climate change scenarios onto subsurface environments and examine how local anthropogenically induced heat fluxes spread into the subsurface. For this study three different data sets from Nuremberg, Rosenheim and Dessau with more than 20 time series each are available.



Tasks

- prepare data (temperature time series, hydrogeology)
- development of statistical / analytical models
- comparison of differences between the three regions
- benchmarking and accuracy assessment of the models

Requirements

- experience in programming languages (preferably Python)
- data management and handling skills
- enthusiasm for development of computational methods

Publication(s) to get started

- Smerdon, J. E., Pollack, H. N., Cermak, V., Enz, J. W., Kresl, M., Safanda, J., & Wehmiller, J. F. (2004). Air-ground temperature coupling and subsurface propagation of annual temperature *signals. Journal of Geophysical Research: Atmospheres, 109*(D21).
- Menberg, K., Blum, P., Kurylyk, B. L., & Bayer, P. (2014). Observed groundwater temperature response to recent climate change. *Hydrology and Earth System Sciences*.
- Kurylyk, B. L., MacQuarrie, K. T., & McKenzie, J. M. (2014). Climate change impacts on groundwater and soil temperatures in cold and temperate regions: Implications, mathematical theory, and emerging simulation tools. *Earth-Science Reviews*, *138*, 313-334.

Supervisors

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