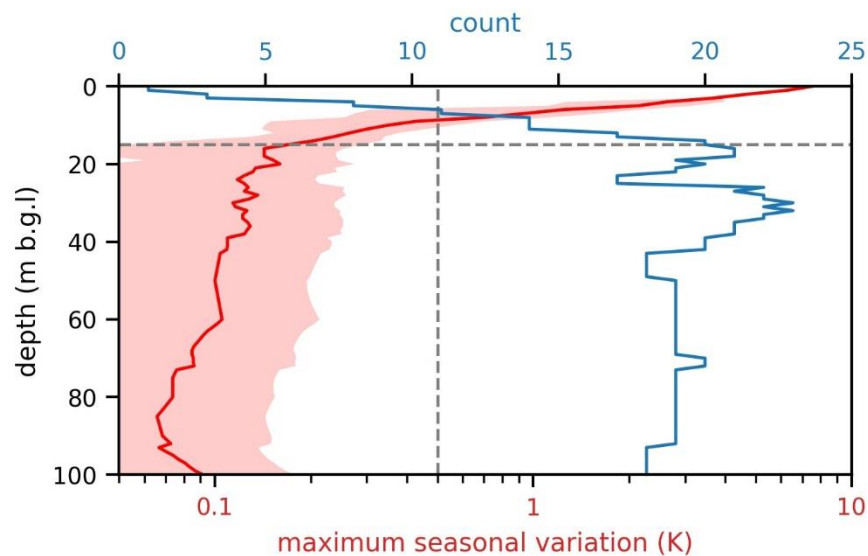


Supplementary Material

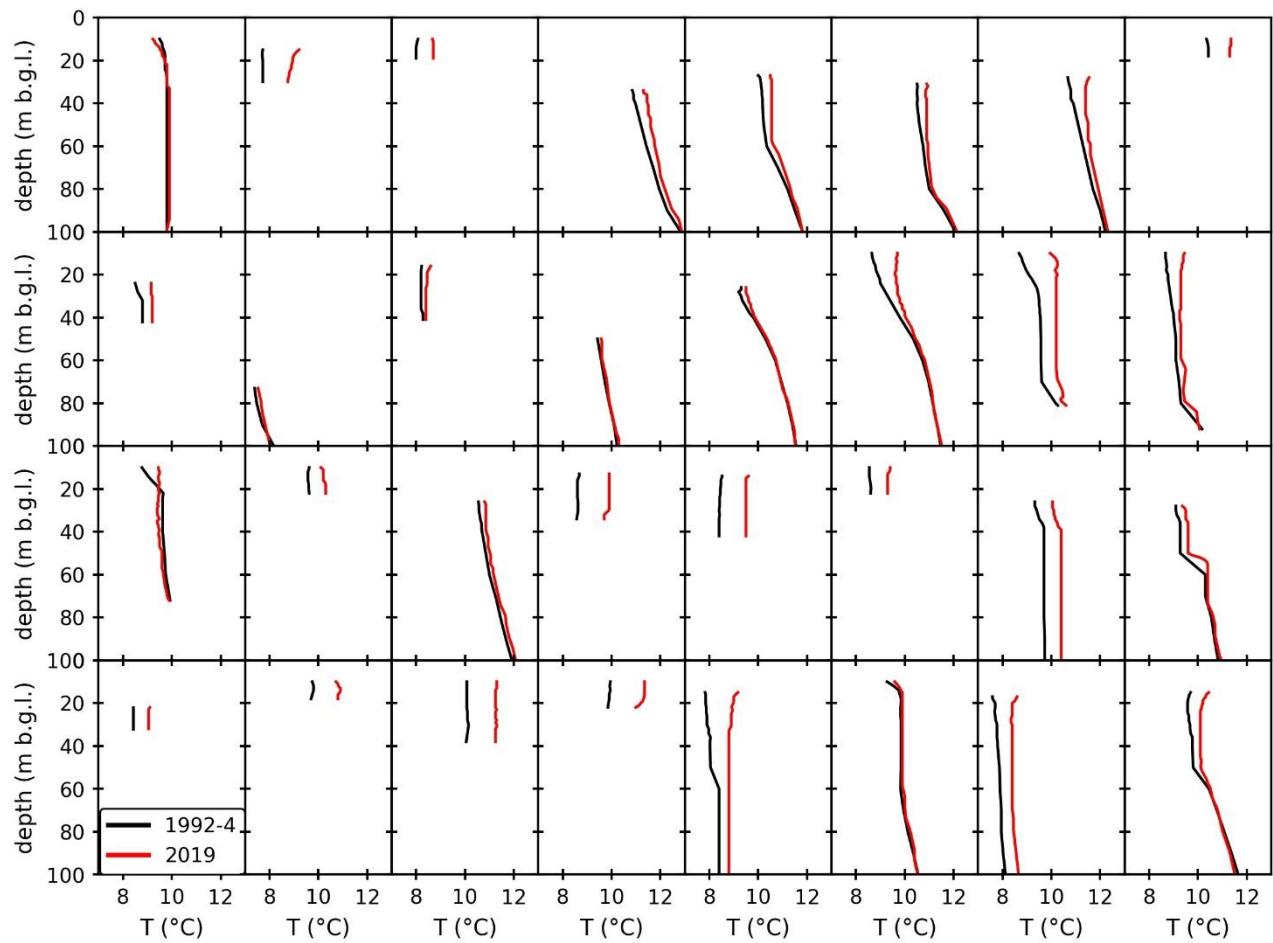
1 Supplementary Figures

Figure S1 shows the maximum seasonal variation of the 32 observation wells during the 1992-4 period. The maximum seasonal variation has been calculated as maximum-minimum difference out of 4 seasonal measurements at a 1 m depth resolution.



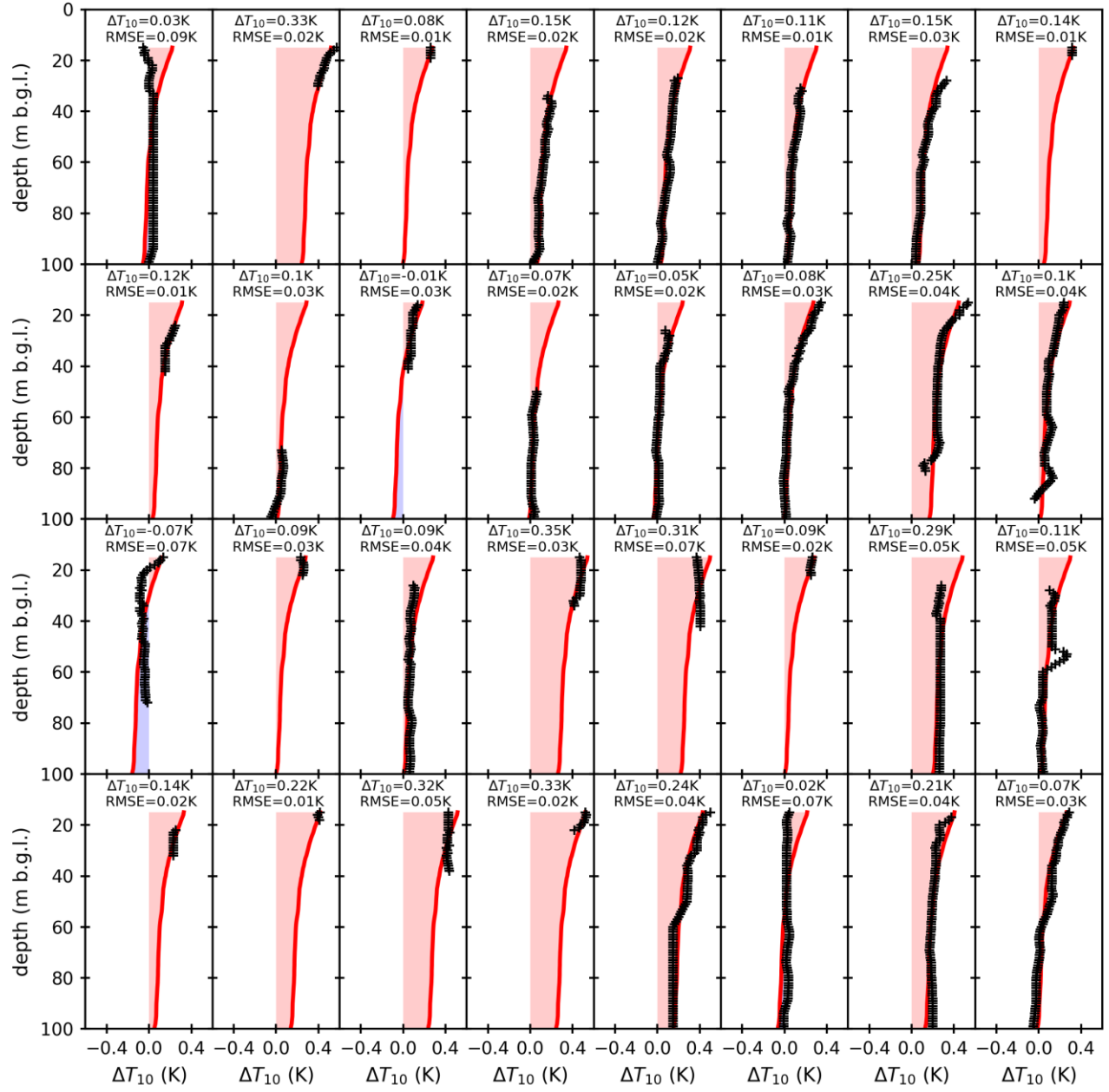
Supplementary Figure S1. Mean values of the seasonal maximum minimum difference of the 32 selected observation wells during the 1992-4 period (red line) $\pm$ one standard deviation (red area) and the number of sample values for computing the mean value (count, blue line). The horizontal dashed line (15 m) indicates the depth for separating the seasonally influenced or dominated temperature regimes. The vertical line (0.5 K) is the threshold defined for selecting seasonally undisturbed temperature records.

Figure S1 shows the mean of the repeated temperature depth profiles of the respective periods from 1992-4 and 2019.



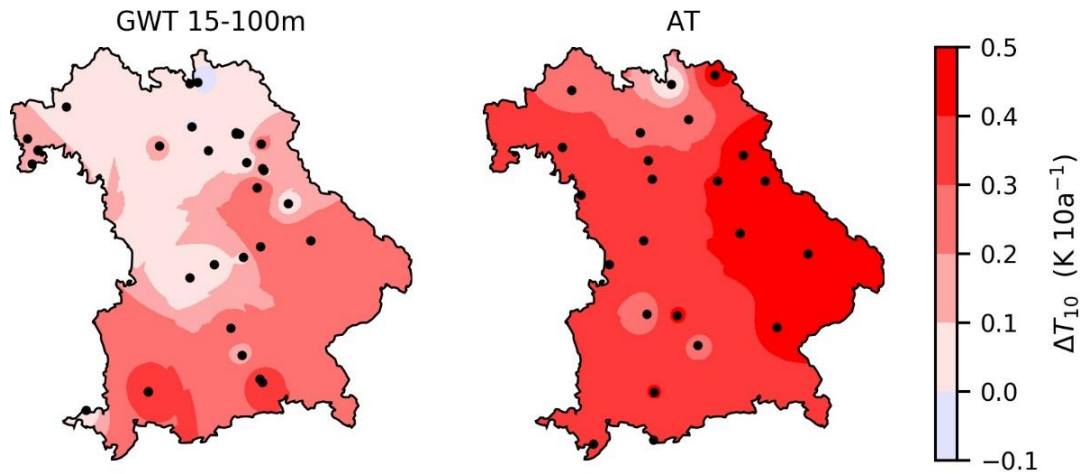
Supplementary Figure S2. Mean temperature depth profiles of the repeated measurements of the 1992-4 and 2019 period.

Figure S3 shows the result of the root-mean squared error (RMSE) based fitting of a reference profile on the measured ΔT profiles at each station. The reference profile is shifted with a step width of 0.001 K. RMSEs are calculated for each step and the step with the lowest RMSE is used as prediction or fitted reference profile in Figure S3 and the alternative approach in the main text body.



Supplementary Figure S3. Fitted (red line) and measured (black crosses) mean temperature differences per decade (ΔT_{10}) of the observation wells. ΔT_{10} values given represent the mean value for each profile. Root mean squared errors (RMSE) reflect the error between the fitted and measured ΔT_{10} data.

Figure S4 shows an inverse distance weighting interpolation of the mean ΔT_{10} rates in groundwater (GWT, cf. Figure S3) and air temperature (AT). The spatial distribution of the mean ΔT_{10} rates in groundwater are used as alternative approach for calculating the shallow geothermal potential in the main text body.



Supplementary Figure S4. Interpolated ΔT_{10} rates in groundwater (GWT) and air temperature (AT). Datapoints are indicated by black dots. Groundwater ΔT_{10} rates are given as mean between 15 and 100 m depth. Map is projected in EPSG 31467 and clipped to the outline of the federal state of Bavaria.