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MulT_predict

A multicomponent geothermometer for precise reservoir temperature estimation

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Motivation

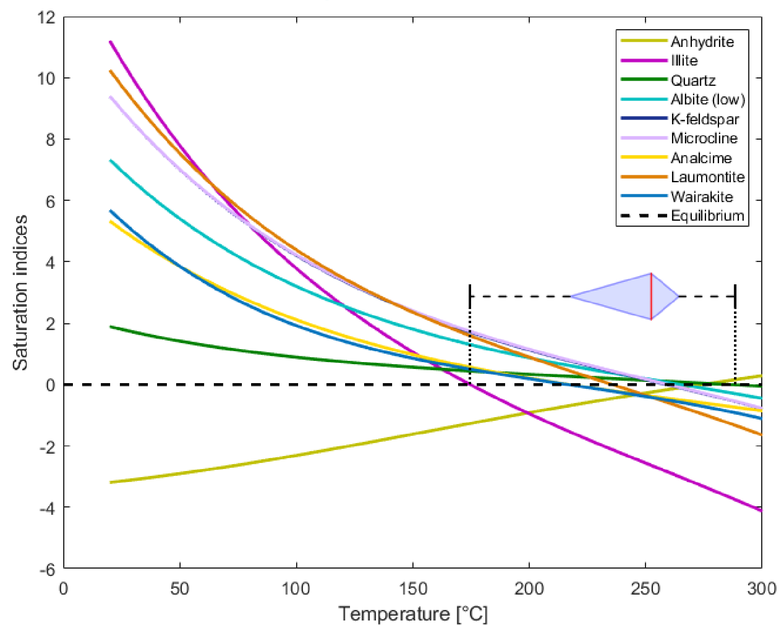
- Create an economical exploration tool to precisely estimate reservoir temperatures from fluid samples
- Standard quantitative water analysis based multicomponent geothermometry
- Sensitivity analyses for back calculation on in-situ system parameters and correction from secondary processes

Conclusion and outlook

- MulT_predict can be applied on natural spring water of meteoric origin as well as on saline fluids
- The estimated reservoir temperature matches the measured temperature with an uncertainty of ±5%
- Future implementation of more chemical reaction models to reconstructed the geothermal fluid at reservoir conditions

Saturation indices as geothermometers

Equilibrium of the mineral phases
used for the temperature estimation of the reservoir

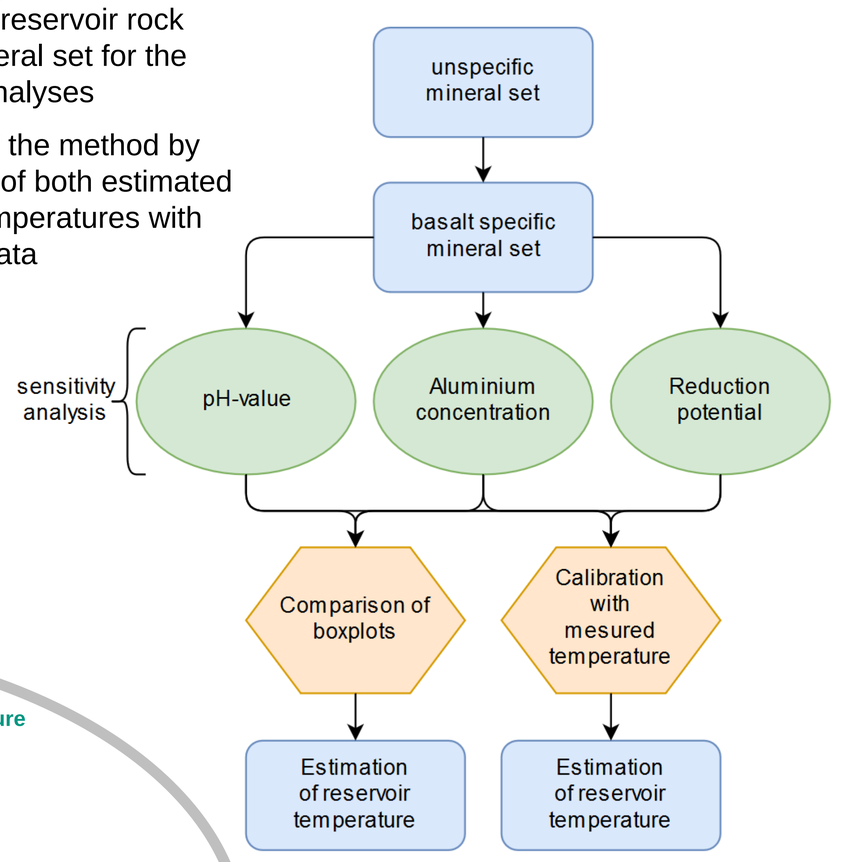


- Temperature estimation can be deduced from the geochemical equilibrium between mineral phases and the reservoir rock
- Temperature dependent saturation index functions serve as geothermometers

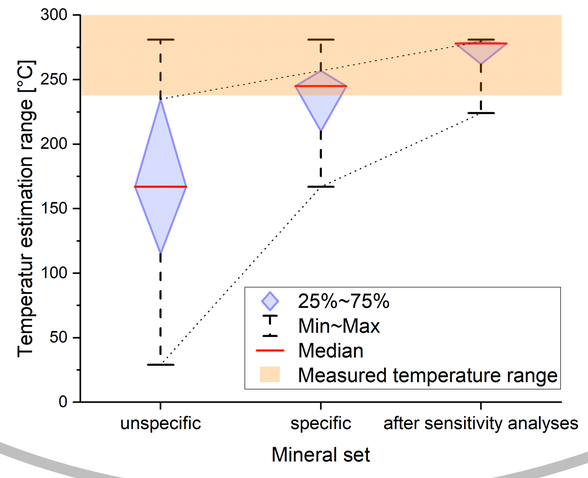
Workflow of the validation

- Constraining the mineral phases to a reservoir rock specific mineral set for the sensitivity analyses
- Validation of the method by comparison of both estimated reservoir temperatures with measured data

Flowchart of the validation



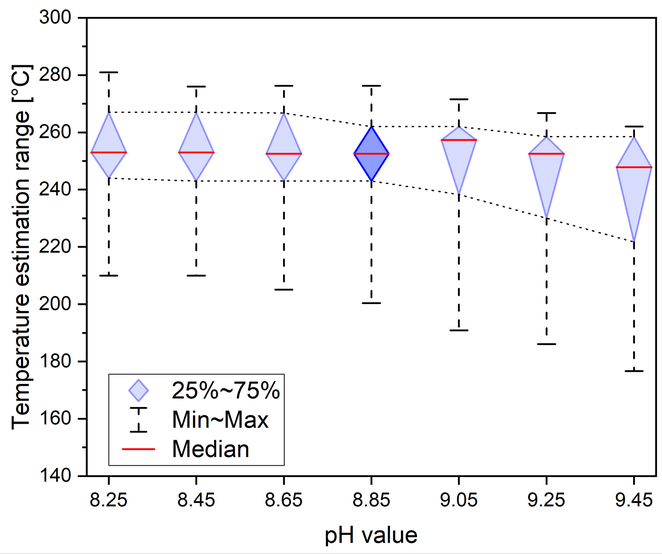
Temperature estimation
Comparison of three stages with the measured temperature



Sensitivity analysis

- Basic assumption: chemical equilibrium of fluid and reservoir rock minerals
- Improvement of the estimated reservoir temperature by minimization of the boxplot spread
- Variation of the value yield of sensitive geochemical parameters: pH-value, aluminium concentration and reduction potential

Example of the sensitivity analysis
for the best fit pH value



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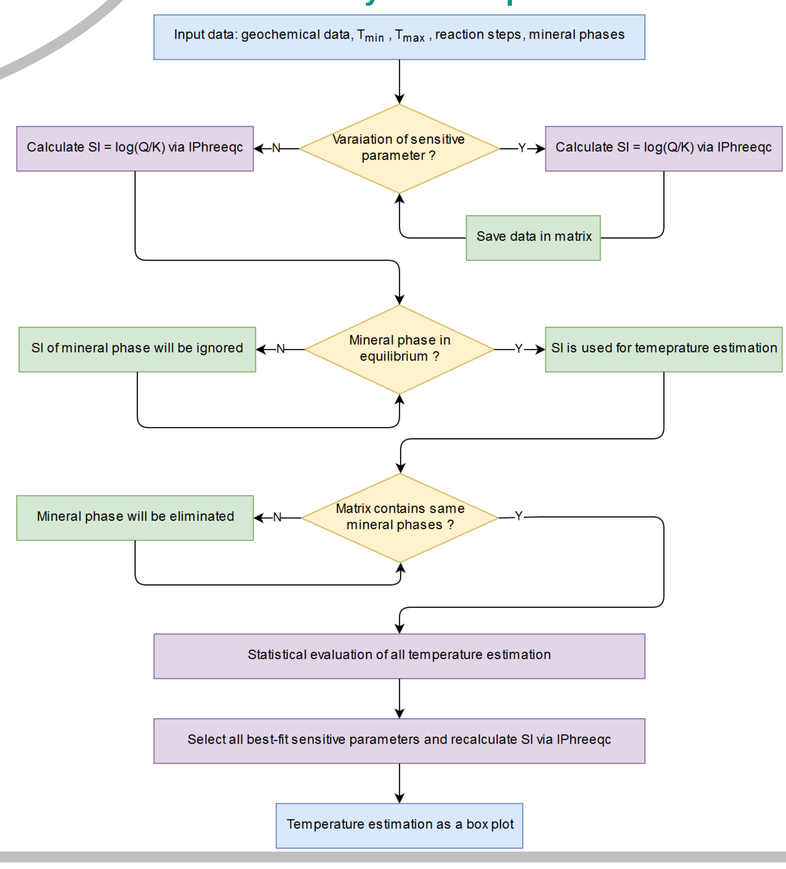
Functionality of MulT-predict



Publication of major contribution

Nitschke, F.; Held, S.; Villalon, I.; Neumann, T.; Kohl, T. (2017): Assessment of performance and parameter sensitivity of multicomponent geothermometry applied to a medium enthalpy geothermal system. In: Geothermal Energy 5 (1)