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An Integrated Sensitivity Analysis for Multicomponent Geothermometer for High Temperature Settings

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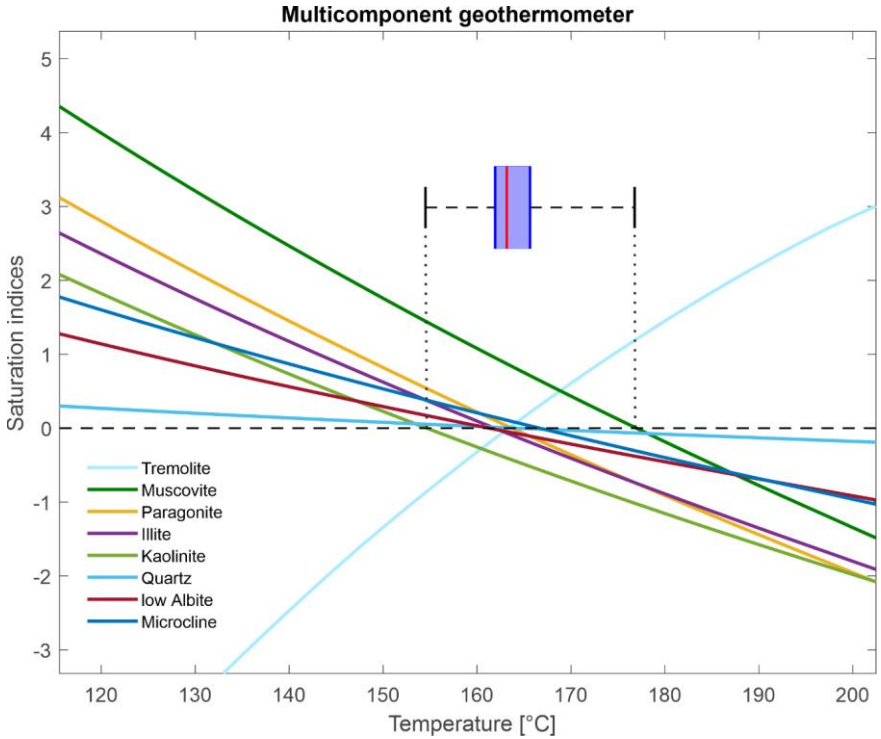
Multicomponent geothermometry



- Using multiple mineral phases as geothermometer
- Plotting the saturation curves of minerals against temperature
- Temperature estimation is given when mineral phase is in equilibrium (*SI* = 0; intersecting dashed line)

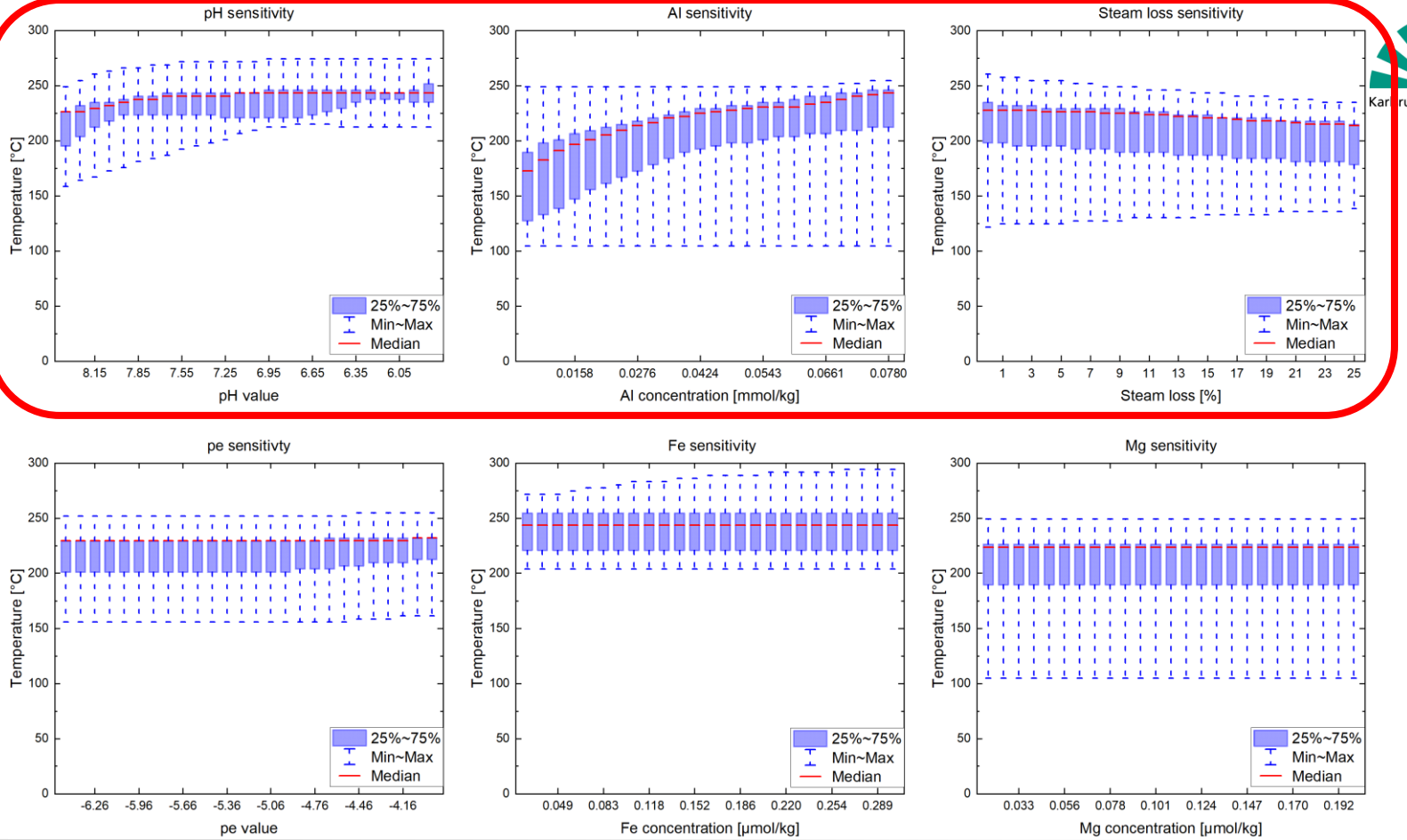
$$SI(T) = \left(\frac{IAP}{K(T)}\right)$$

SI = saturation index, *T* = temperature, *IAP* = ion activity product, *K* = thermodynamic equilibrium constant

Uncertainties

- Fluid is vulnerable to secondary processes while ascending to the surface, disturbing the equilibria of mineral phases:
  - Boiling
  - Phase segregation
  - Mixing
  - Dilution
  - Precipitation
- Performing sensitivity analyses to reconstruct reservoir conditions

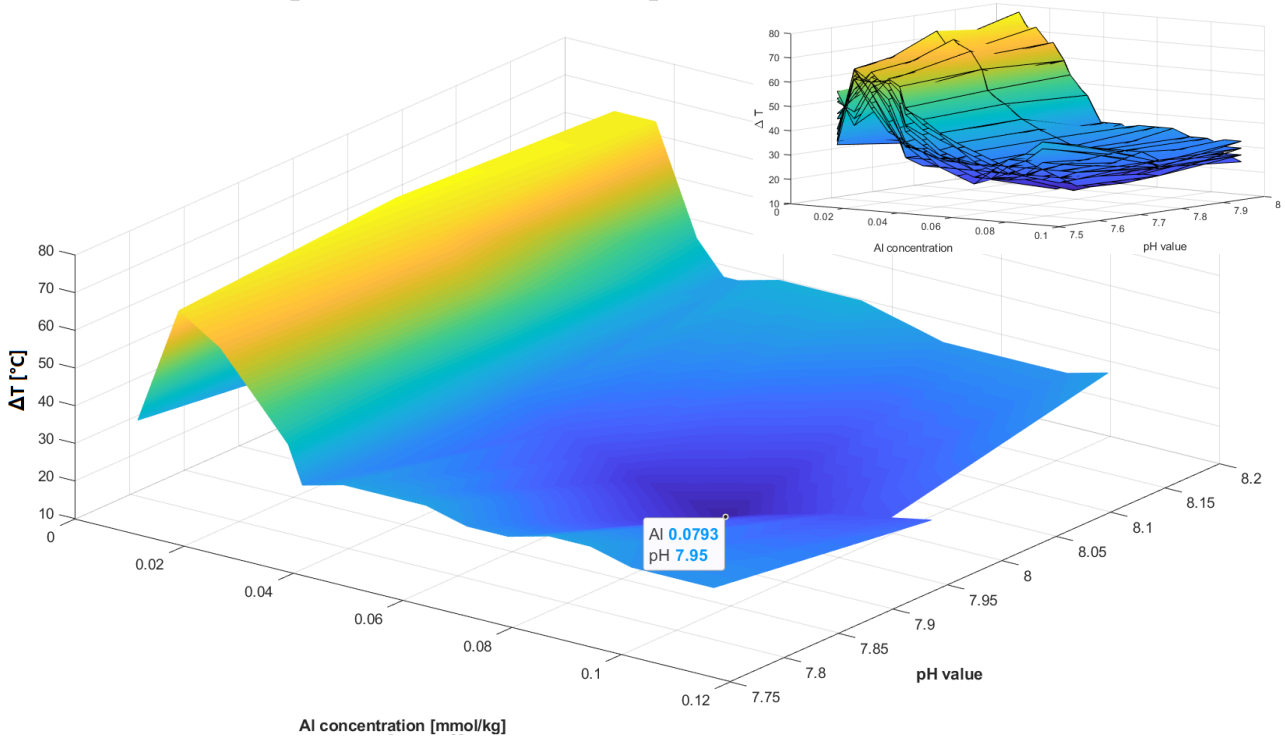
Multiple sensitivity analyses of the well K-28, Krafla (Iceland)



Sensitive parameters

- pH value:
  - Uncertainties due to CO_2 and H_2S buffering, temperature dependence, steam loss and boiling, measuring errors (field / laboratory)
- Aluminium concentration:
  - Uncertainties due to pH changes, forming and precipitation of aluminium complexes, fluid sampling (filter), measurement close to detection limit
- Steam loss / dilution:
  - Uncertainties due to element concentration errors

Interdependent optimisation process



- Global minimum: Al concentration 0.079 mmol/kg, pH 7.95 ,and 14 % steam loss

Result given by MulT_predict

K-28