

# Nutrient dynamics along the forest floor – mineral soil continuum

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## Introduction & Questions

The Forest Floor (FF) is an important nutrient source at sites with low nutrient availability of the mineral soil. However, FF mediated tree nutrition is expected to change with climate warming together with increased turnover of soil organic matter.

1. What is the impact of increasing temperatures on nutrient availability of beech forests?
2. How does this impact depend on the nutrient status of the mineral soil?



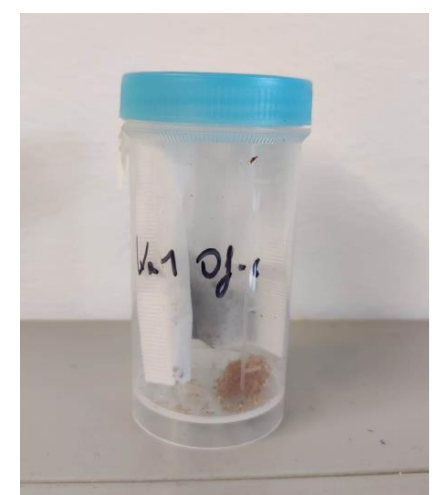
Fig. 1: Soil monolith showing a Cambisol with its moder

## Method optimization

### Mimicking roots using ion exchangers:

1. **Sorption** (soil + exchanger + H<sub>2</sub>O): ions from soil sorb to resin
2. **Elution** (exchanger + HCl): H<sup>+</sup>/Cl<sup>-</sup> exchange the ions sorbed to exchanger surface
3. **Analysis** of HCl extract: ICP (cations, total P), TN Analyzer (total N), Molybdenum-blue method (PO<sub>3</sub><sup>-</sup>)

### But how?



A: Resin in tea bag  
B: Soil in tea bag



C: Resin in polyamide net



D: Resin in polyamide bag



E: Cation exchange membranes

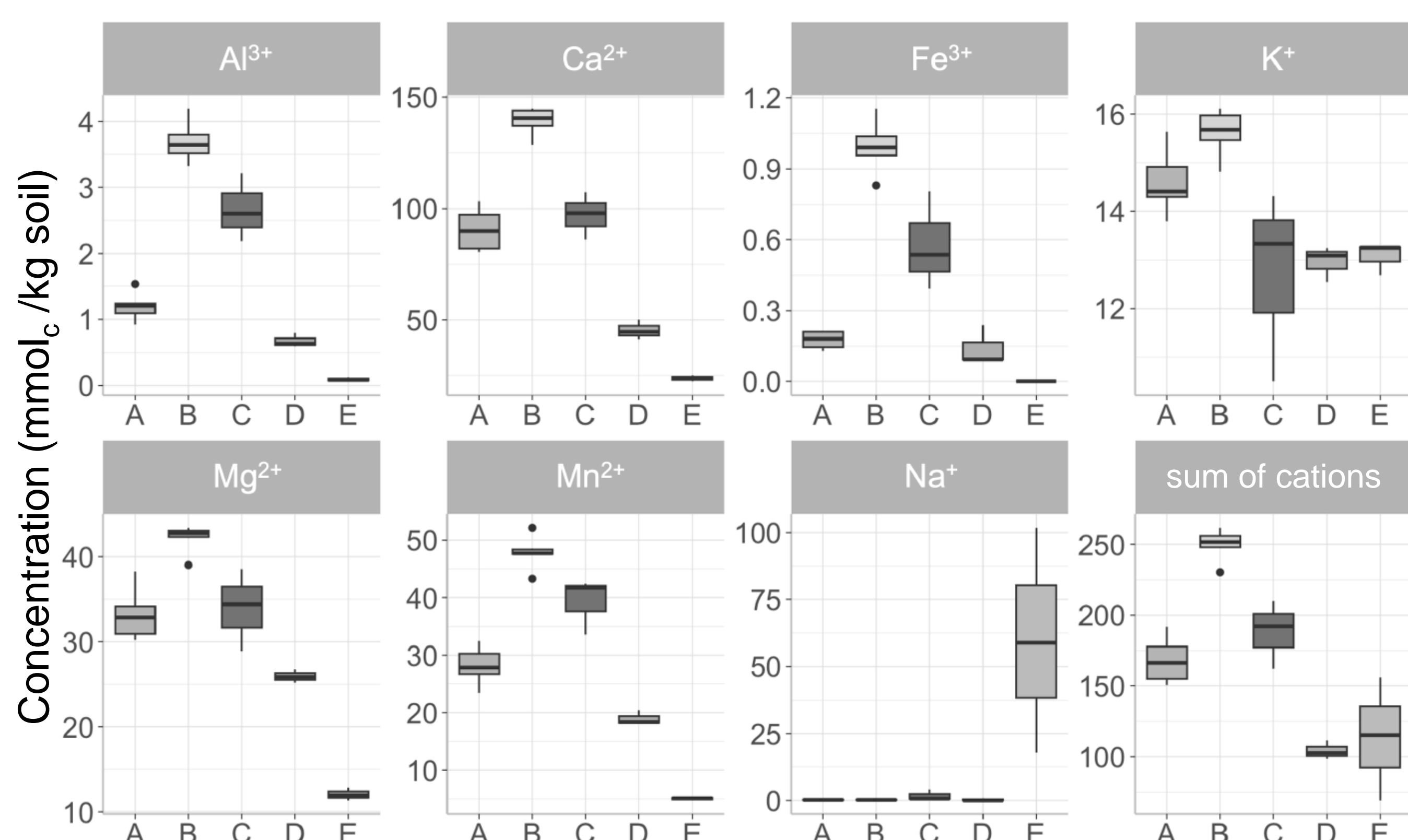


Fig. 2: comparison of different extraction methods using cation exchangers

### The extraction method matters!

Exchanger mobility rather than soil particle mobility influences extraction efficiency

## Experimental setup

Advantages of extraction setup:

- ✓ Easy separation of soil and resin thanks to polyamide net locked in place with an insert
- ✓ Horizontal shaking ensures optimal resin mobility and ion exchange between soil and resin
- ✓ No contamination of polyamide net



Fig. 3: setup

## Preliminary results

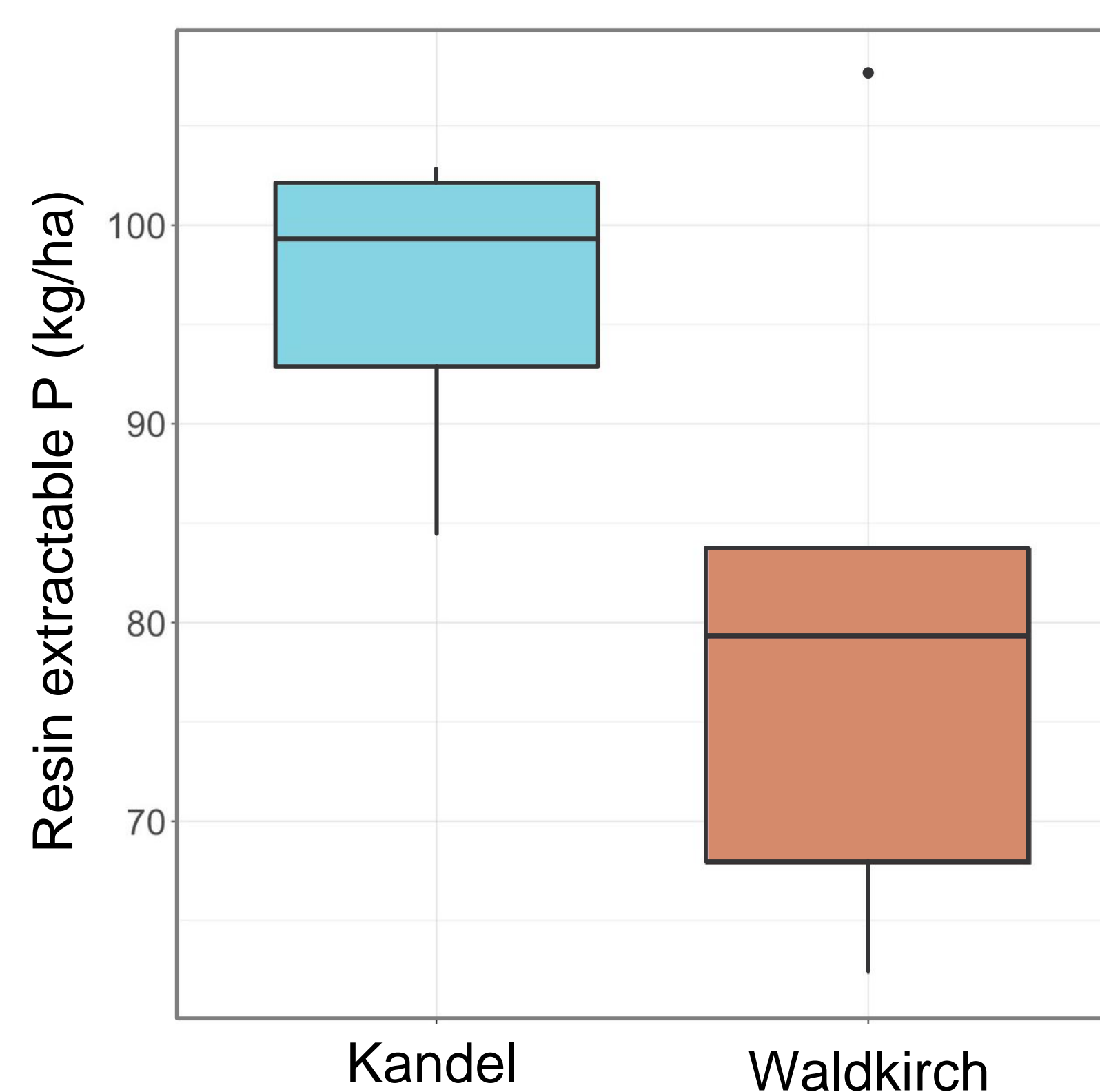


Fig. 4: Stock of resin extractable P of the FF and of the upper 10 cm of mineral soil from Kandel (MAT 5 °C) and Waldkirch (MAT 9 °C)

Higher temperatures on P poor sites decrease the stock of available P of the FF and of the upper 10 cm of mineral soil.

## Conclusion

→ A standardized method for nutrient extraction using ion exchangers is needed.

→ First results show a decrease of P availability with rising temperatures on P poor sites. This supports the crucial role of the FF for beech forest nutrition and its vulnerability under climate change.

