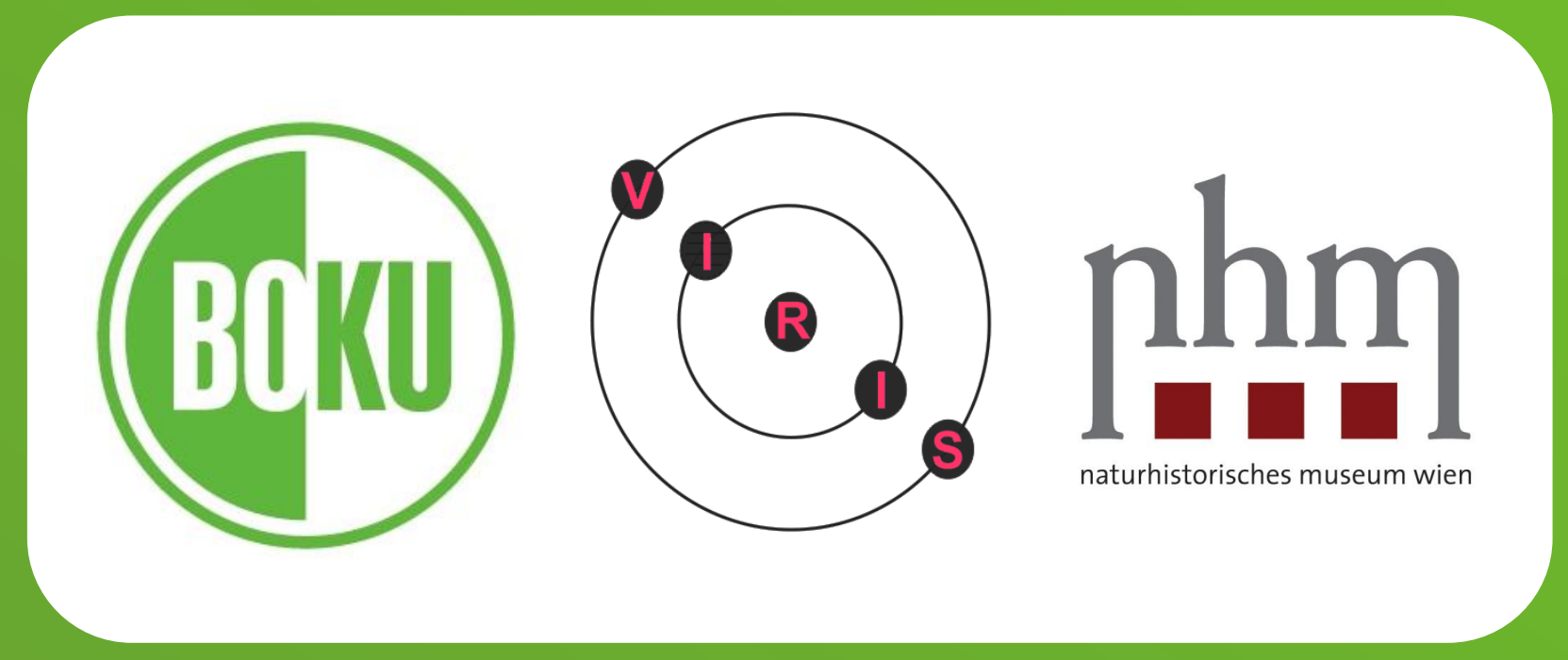


# Autochthony in the early medieval settlement of Thunau/Kamp, Austria? A question explored by $^{87}\text{Sr}/^{86}\text{Sr}$ isotope ratios using MC-ICPMS

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## Introduction

Strontium isotope ratios are a key tool for determining migration patterns in anthropology:

- $^{87}\text{Sr}/^{86}\text{Sr}$  ratios are characteristic for a specific region ("local signal")
- Sr substitutes for Ca in teeth and bones due to its similar chemical properties
- Tooth enamel is formed during childhood and not significantly altered later in life; the incorporated Sr represents the isotopic composition of the environment in which the individual was living during his early years (provided that the food came from the close proximity)

The excavation site under investigation is located in the Lower Austrian region of Thunau/Kamp, dated to the Early Middle Ages (9<sup>th</sup> to 10<sup>th</sup> century AD) and includes a hilltop fortification and a settlement in the valley.

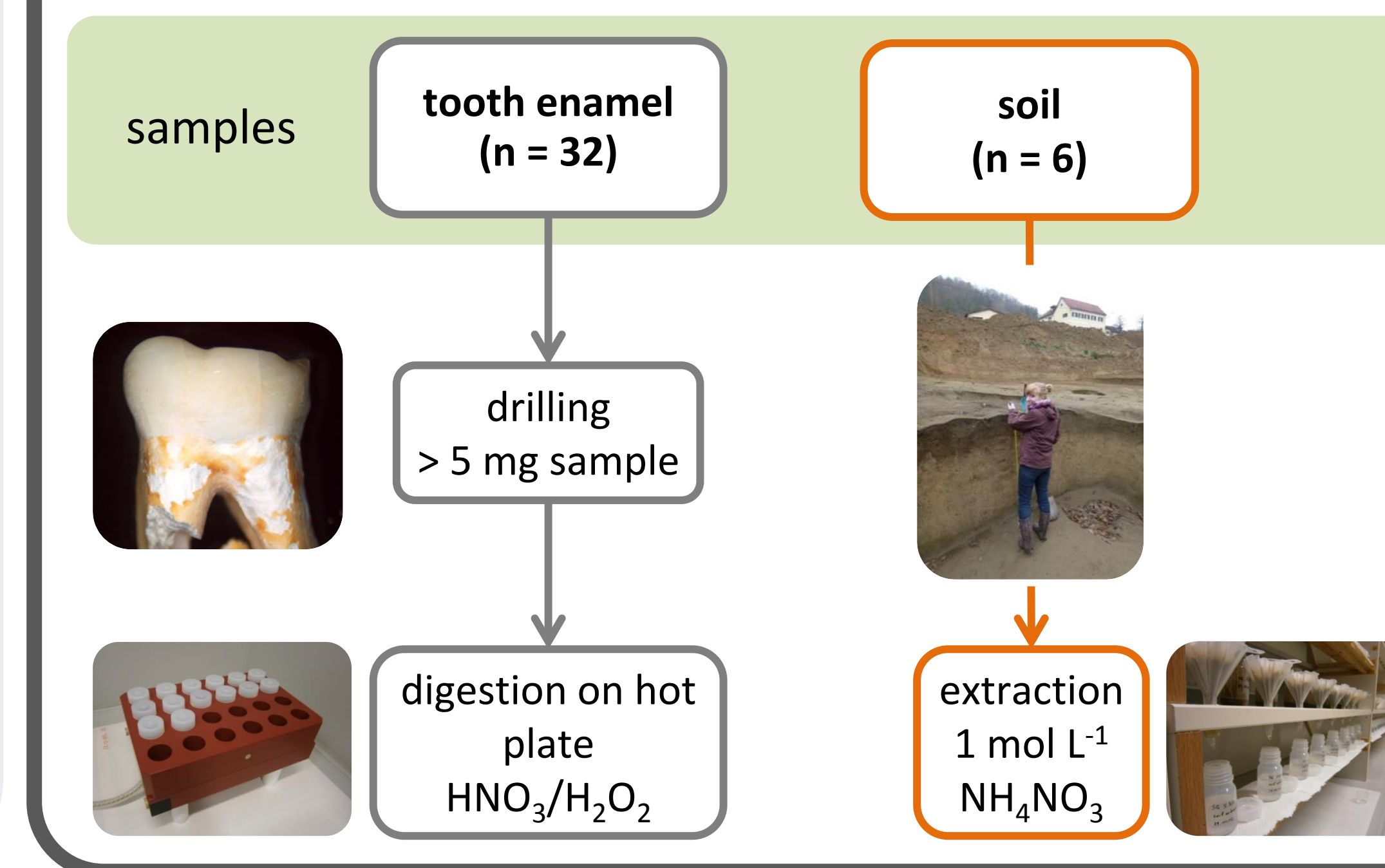
## Hypothesis

The population of the early medieval settlement in Thunau/Kamp was autochthonous. Therefore, the Sr ratios from the enamel of the population lie within the  $^{87}\text{Sr}/^{86}\text{Sr}$  range of the locally specific bioavailable signature.

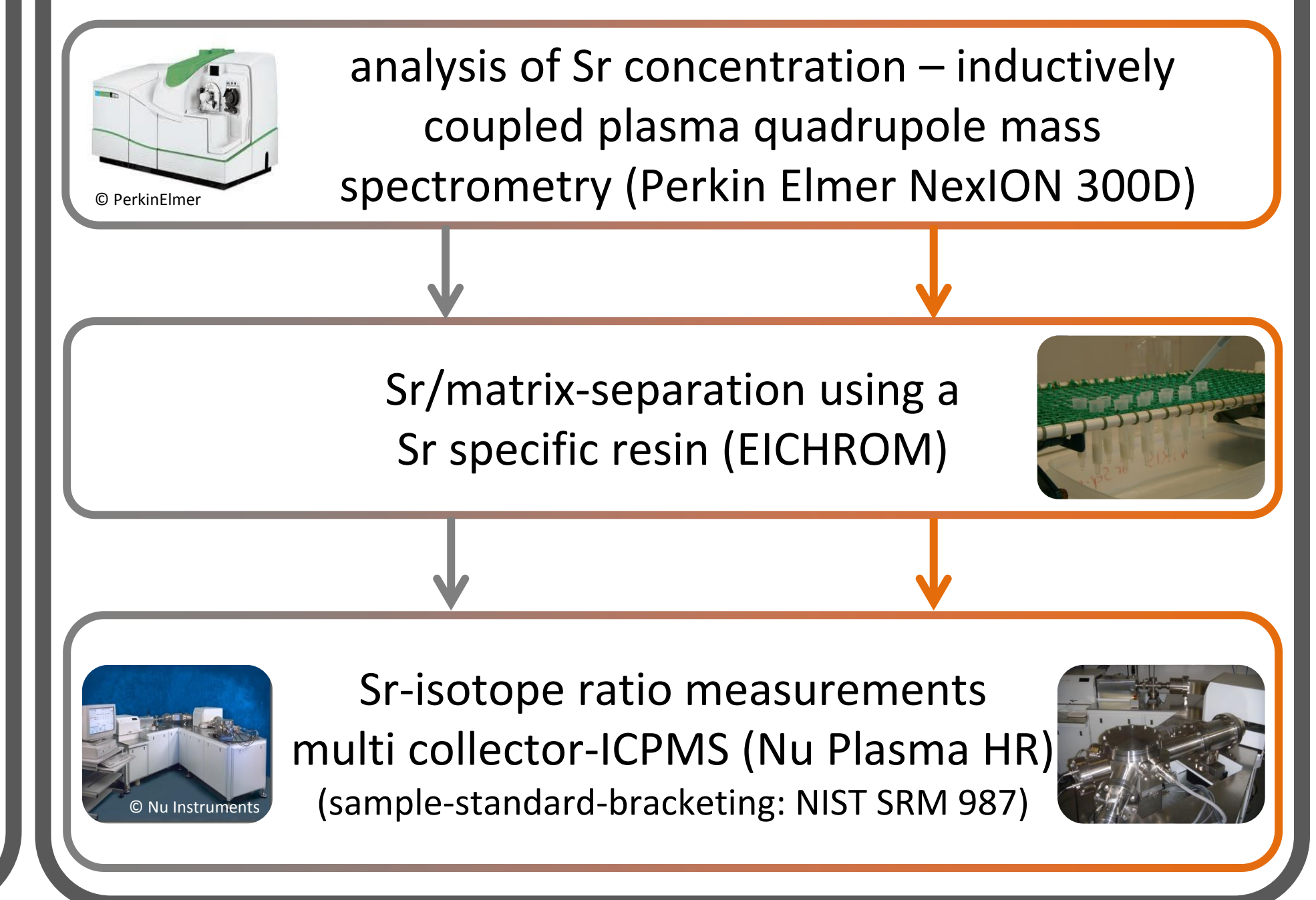
## Strategy

- Determination of the bioavailable Sr signature in environmental samples
- Estimation of the average daily Sr uptake via nutrition by analysis of recent and archaeological environmental samples as well as historic animal enamel
- Sampling of enamel for detection of the Sr signal taken up during childhood

## Methods – sample preparation



## Methods – analytical setup



## The settlement of Thunau/Kamp: Geology and bioavailable strontium isotopic signal



Fig. 1: Location of Thunau/Kamp © Ed. Hölzl

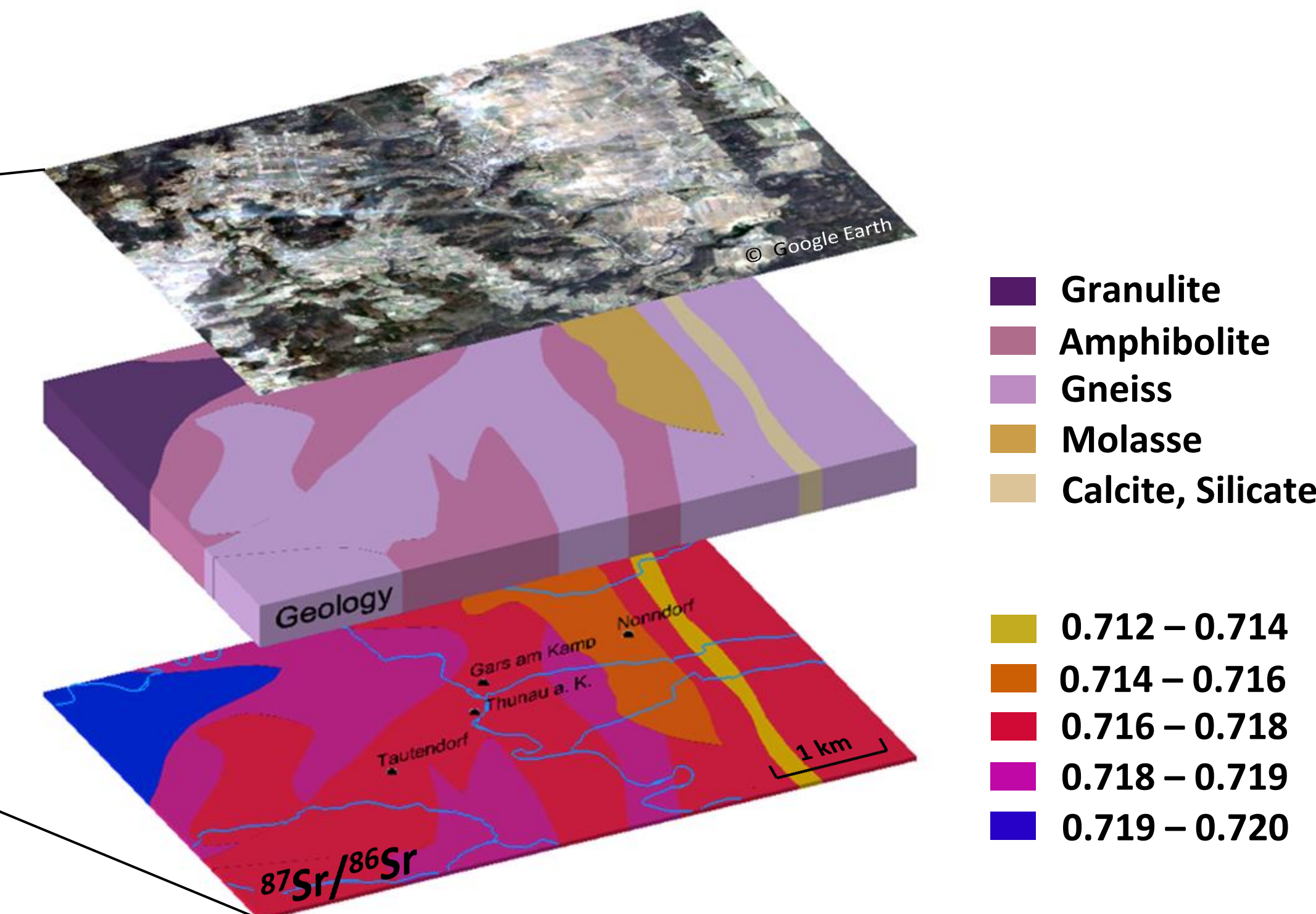


Fig. 2: Geological map of Thunau/Kamp

## Estimated daily (isotopic) Sr uptake via average nutrition in the Early Middle Ages

	amount/g	Sr/ $\mu\text{g g}^{-1}$ food	Sr uptake/ $\mu\text{g}$	$^{87}\text{Sr}/^{86}\text{Sr}$	data source
WATER	2000	0.2	400	0.7182	local well; local river; rain water
CEREALS	200	2	400	0.7170	archaeobotanical rye; regional isoscape
VEGETABLES	150	2	300	0.7135	regional isoscape
MEAT	200	0.5	100	0.7135	historic animal enamel
FISH	100	2	200	0.7170	local fish; local river water
EGGS	25	10	250	0.7170	cereals; local isoscape
MILK	150	0.5	75	0.7152	historic cattle enamel; regional isoscape
DAIRY PRODUCTS	100	4	400	0.7152	historic cattle enamel; regional isoscape
FRUITS	100	1.5	150	0.7135	regional isoscape

**TOTAL Sr UPTAKE:**  
2000 - 3000  $\mu\text{g}$   
 $^{87}\text{Sr}/^{86}\text{Sr} = 0.7161$   
 $u_c = 0.0017$  (k = 1)

Fig. 3: The average daily Sr uptake and resulting  $^{87}\text{Sr}/^{86}\text{Sr}$  composition of the diet for a single individual living in Thunau estimated by analysis of recent and archaeological environmental samples together with historic animal enamel (based on Prohaska et al. *in prep.*)

## Results: $^{87}\text{Sr}/^{86}\text{Sr}$ in tooth enamel samples

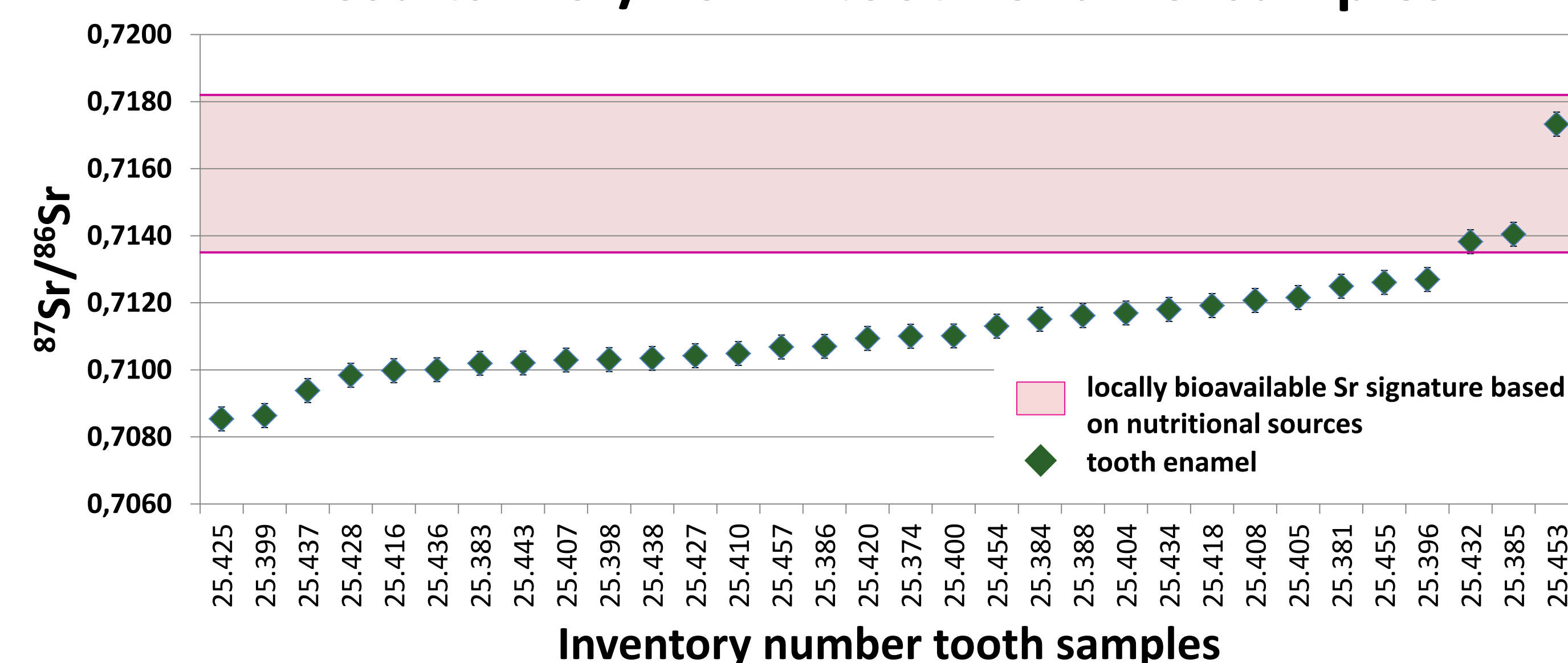


Fig. 4: Strontium isotope ratios enamel samples excavated in Thunau/Kamp sorted in ascend order; error bars:  $U_c$  (k=2)

## Results and Discussion

- Estimation of the average daily Sr uptake and resulting Sr isotopic composition ( $^{87}\text{Sr}/^{86}\text{Sr} = 0.7161$ )
- Definition of the local Sr isotopic signal based on estimated nutrition ( $^{87}\text{Sr}/^{86}\text{Sr} = 0.7135 - 0.7182$ )
- Substantiation of local range by Sr isotope ratio of soil extracts at the excavation site ( $^{87}\text{Sr}/^{86}\text{Sr} = 0.7144 - 0.7162$ )
- Analysis of Sr isotope ratios in enamel samples ( $^{87}\text{Sr}/^{86}\text{Sr} \sim 0.709 - 0.713$ ) and comparison to local Sr signature

Most of the individuals show significantly lower  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios in tooth enamel than the locally bioavailable Sr at the site and the surrounding of the settlement.

⇒ The results do not support the hypothesis of local origin of the majority of the individuals excavated at the settlement of Thunau/Kamp.

## Open questions

- Additional Sr sources or a different composition of the diet to be considered?
- Was there greater mobility in the population than expected?

## Outlook

- Analysis of supplementary environmental samples to establish possible additional Sr sources from historical areas of cultivation in the extended surrounding of the settlement
- Comparison of  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios to those of the population of the fortification

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