

# The influence of (historical) forest litter raking on carbon and nutrient fluxes in Alpine forest ecosystems – first results

Schrott, Roman<sup>1</sup>; Gröber, Maximilian<sup>2</sup>; Müller, Lukas<sup>1</sup>; Simon, Alois<sup>3 5</sup>; Katzensteiner, Klaus<sup>3</sup>; Scharr, Kurt<sup>2</sup>; Markart, Gerhard<sup>4</sup>; Meißl, Gertraud<sup>1</sup>; Geitner, Clemens<sup>1</sup>

<sup>1</sup> University of Innsbruck, Department of Geography  
<sup>2</sup> University of Innsbruck, Department of History and European Ethnology  
<sup>3</sup> BOKU University, Institute of Forest Ecology  
<sup>4</sup> Austrian Forest Research Centre (BFW), Department of Natural Hazards  
<sup>5</sup> Department of Forest Planning, Tyrol Forest Administration, Office of the Tyrolean Government

## Historical background and motivation

Until the middle of the 20th century, litter raking was practiced by local farmers in Tyrol. Farmers needed bedding for their animals, straw was rare, but forest litter was available. The mixture of excrements and litter was later used as fertiliser for the fields.

Throught this historical forest use practise large quantities of organic material was transferred from the forest into agricultural fields. We investigate the influence of litter raking on the carbon and nitrogen balance in this study, to get a better understanding of the consequences for the forest ecosystem

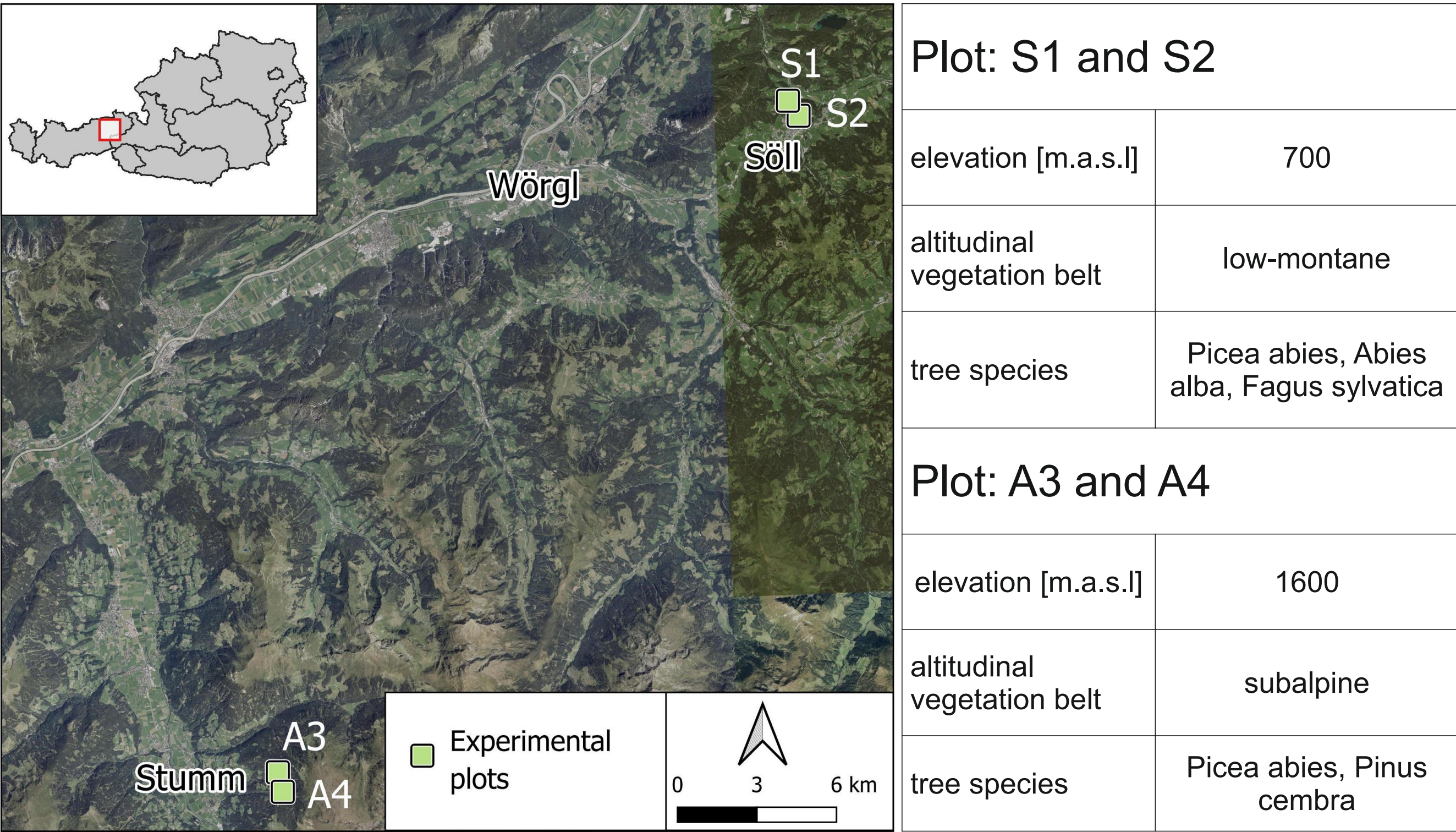
## Methods

The study takes place on two test sites and four experimental plots (S1, S2, A3 and A4) located in North Tyrol.

On twelve random distributed sampling points ground vegetation, ecto-organic layers and mineral soil were sampled, to quantify the carbon and nitrogen stocks.

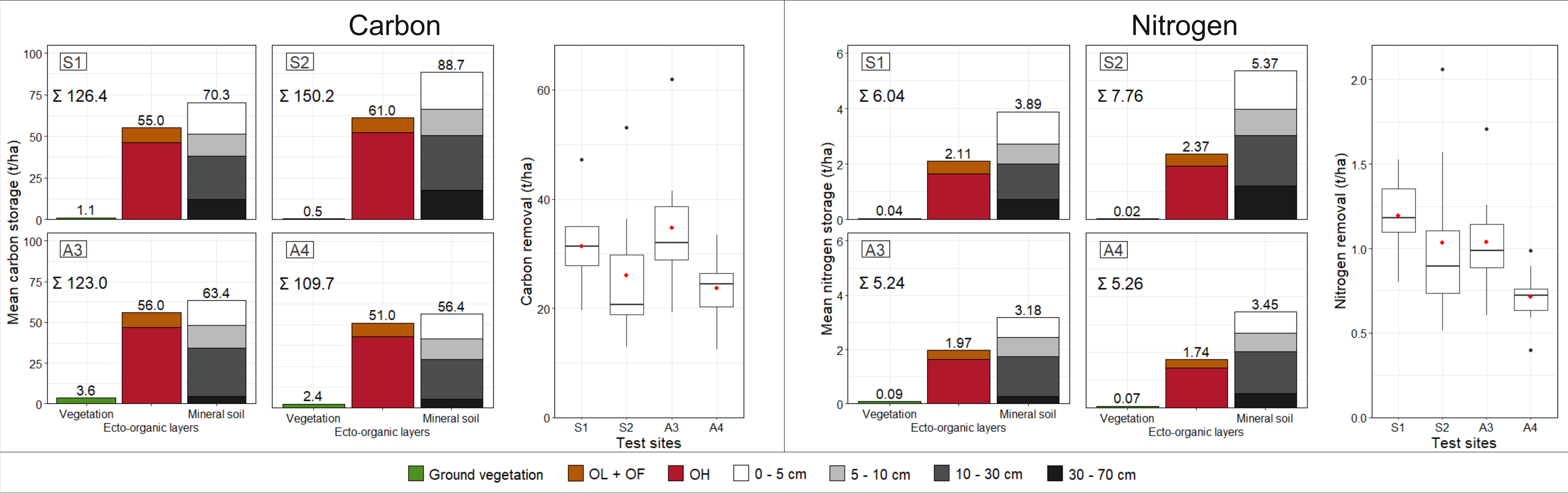
To quantify the amount of litter removed during an onetime litter raking intervention, nine randomly distributed 1 m<sup>2</sup> subplots were litter raked. The mass and volume of the organic material was determined in the field and subsamples were taken.

All subsamples were analysed for carbon and nitrogen content using an element analyser.



Locations and characteristics of the four test sites

## Results



Mean carbon and nitrogen storage of the four different plots and the amount of carbon and nitrogen removed by the experimental litter raking

Onetime litter raking leads to

- 17 to 28 % of the total carbon stocks
- 13 to 20 % of the total nitrogen stocks

## Next steps

In Tyrol, a detailed inventory of the forest was carried out around 1840, which recorded timber stocks but also litter raking. These recordings are accompanied by corresponding maps, that allow the spatial location of the quanties.

The next step is to analyse the historical data and combine it with the results of the field experiments and laboratory analyses. This will make it possible to quantify and analyse historical carbon and nutrient fluxes from forest ecosystems to agricultural fields.



Historical map of the forest district Fügen around 1840  
Source: © Tyrolean Provincial Archives, Sign. TLA, KuP 2868