

# Always delayed ? Holocene and current evolution of Pasterze Glacier, Austria

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## Introduction

- Pasterze Glacier is currently strongly shrinking as other glaciers in the Alps
- due to this retreat: finds of peat fragments and tree remnants at the retreating terminus since ca. 1990
- these finds prove former recession phases
- is a further warming at all necessary to explain the Pasterze finds ?

## Site and material

- Pasterze Glacier: Austria's largest glacier (1855: A 26.5 km<sup>2</sup>, L 11.4 km, 2012: A 16.6 km<sup>2</sup>, L 8.1 km)
- finds of remnants of long-lived trees as well as peat fragments at or near the glacier margin
- usually detrital material, however, an in-situ location got free of ice around 2010 (Fig. 1), allowing sampling of sediment profile and large tree remnants (Fig. 2, 3)

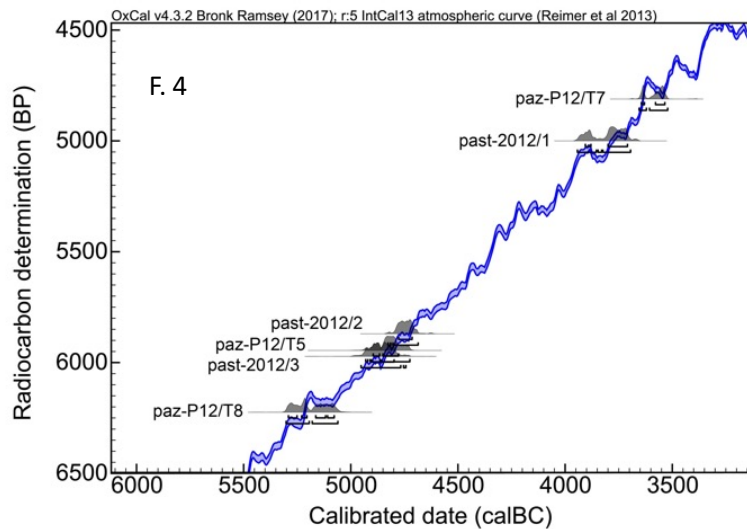


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Fig. 1 Terminus of the Pasterze Glacier (situation 2013) with marked position of the in-situ location. Fig. 2. Upper section of the mid-Holocene sediment profile (2012). Fig. 3. In-situ log in the vicinity of the profile (sampling 2013).

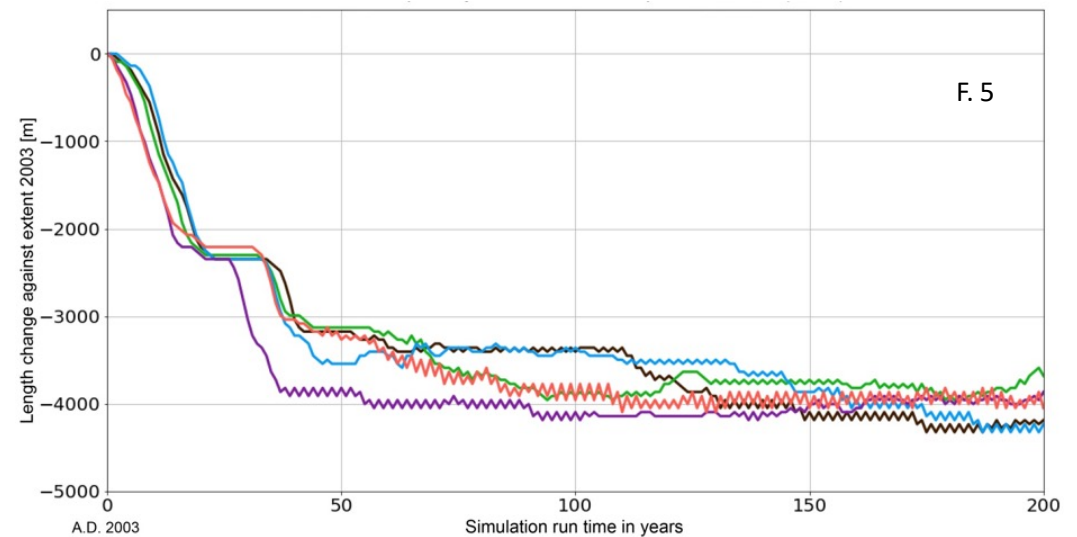
### Methods, results and conclusions I – reconstruction

- dendrochronology and radiocarbon dating were applied to date logs and other organic material
- ca. 80 dendro- and  $^{14}\text{C}$ -dates so far
- sampled tree remains and organic layers are from the early and middle Holocene, i.e. date between ca. 10.2 and 3.5 ka
- the dates of the in-situ profile (Fig. 4) prove an at least ca. 1600 years long recession of the Pasterze Glacier behind its 2010 A.D. limits
- the neoglacial expansion of the glacier beyond its today's extent probably occurred around 3.5 ka and with that relatively delayed compared to other Alpine glaciers



### Methods, results and conclusions II – modeling

- modeling of the length of the Pasterze Glacier in equilibrium with the present climate by utilizing the glacier model OGGM
- using current, i.e. 1980-2010, observed temperature and precipitation data to force the model
- climate data randomly arranged for the model runs, 5 runs
- Pasterze Glacier will continue its retreat over decades to reach equilibrium conditions with significantly reduced extents (Fig. 5), i.e. it will lose its long flat tongue (Fig. 1) within decades
- the current climate conditions are enough, i.e. no further warming is needed, to explain the possibility of tree growth and peat formation on the glacier forefield at locations that got free of ice in recent years



# **If you have questions and comments – you can contact us via email**

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