International Mountain Conference 2019
September 8-12, 2019, Innsbruck, Austria
WS 1.1.C Past climate Change – proxies and modeling

universität innsbruck

Recent finds of remnants of long-lived trees and peat at glacier termini in the Alps – evidence for climatic conditions that are still "normal" today ?

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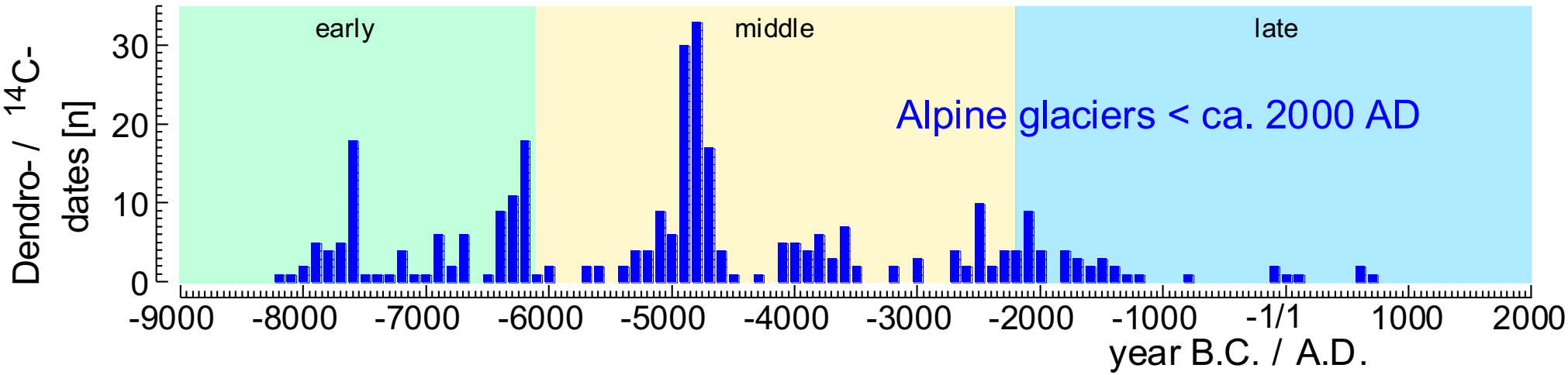
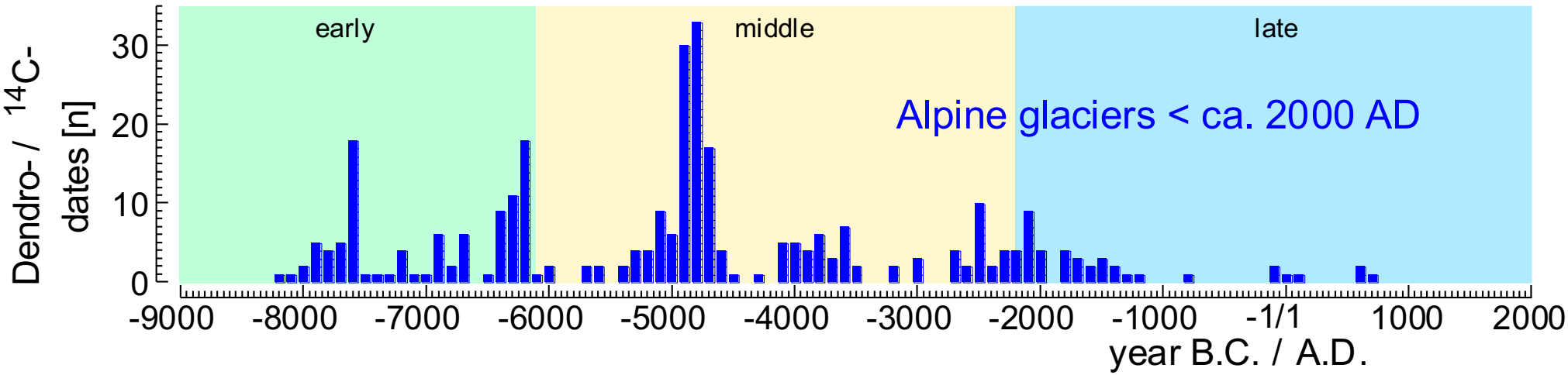
Pasterze Glacier, Austria, 2012

Morteratsch Glacier, Switzerland, 2011

Tschierva Glacier, Switzerland, 2017


early
middle
late
Alpine glaciers < ca. 2000 AD
Dendro- / 14C-dates [n]
0
10
20
30
-9000
-8000
-7000
-6000
-5000
-4000
-3000
-2000
-1000
-1/1
1000
2000
year B.C. / A.D.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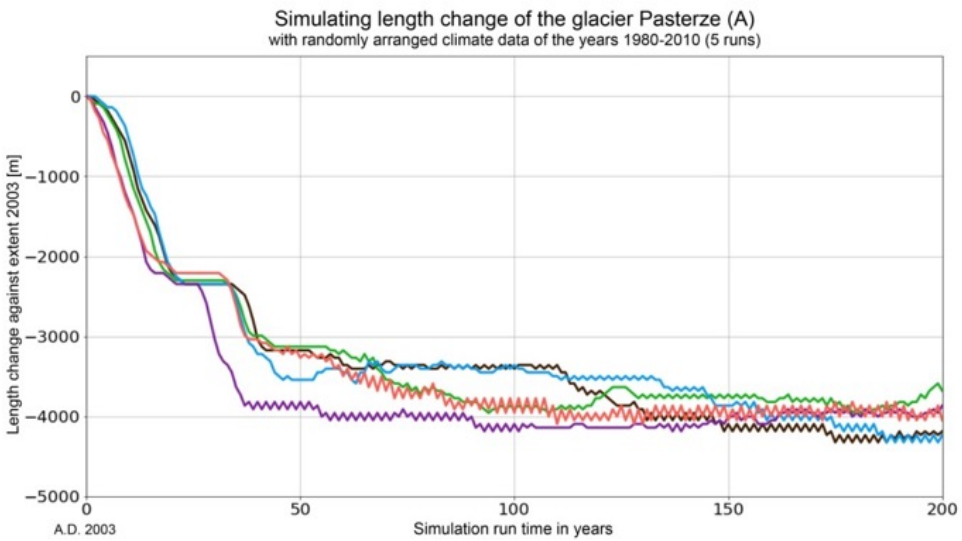
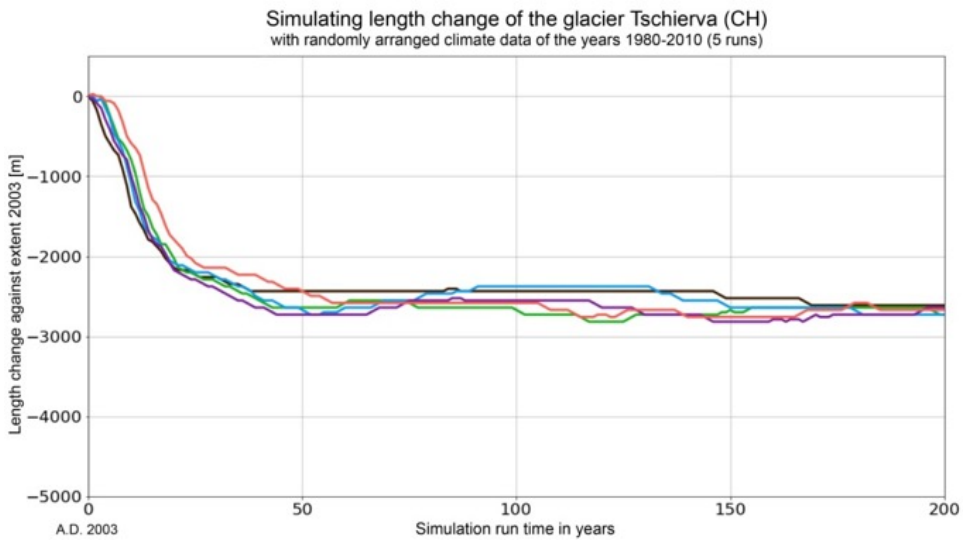
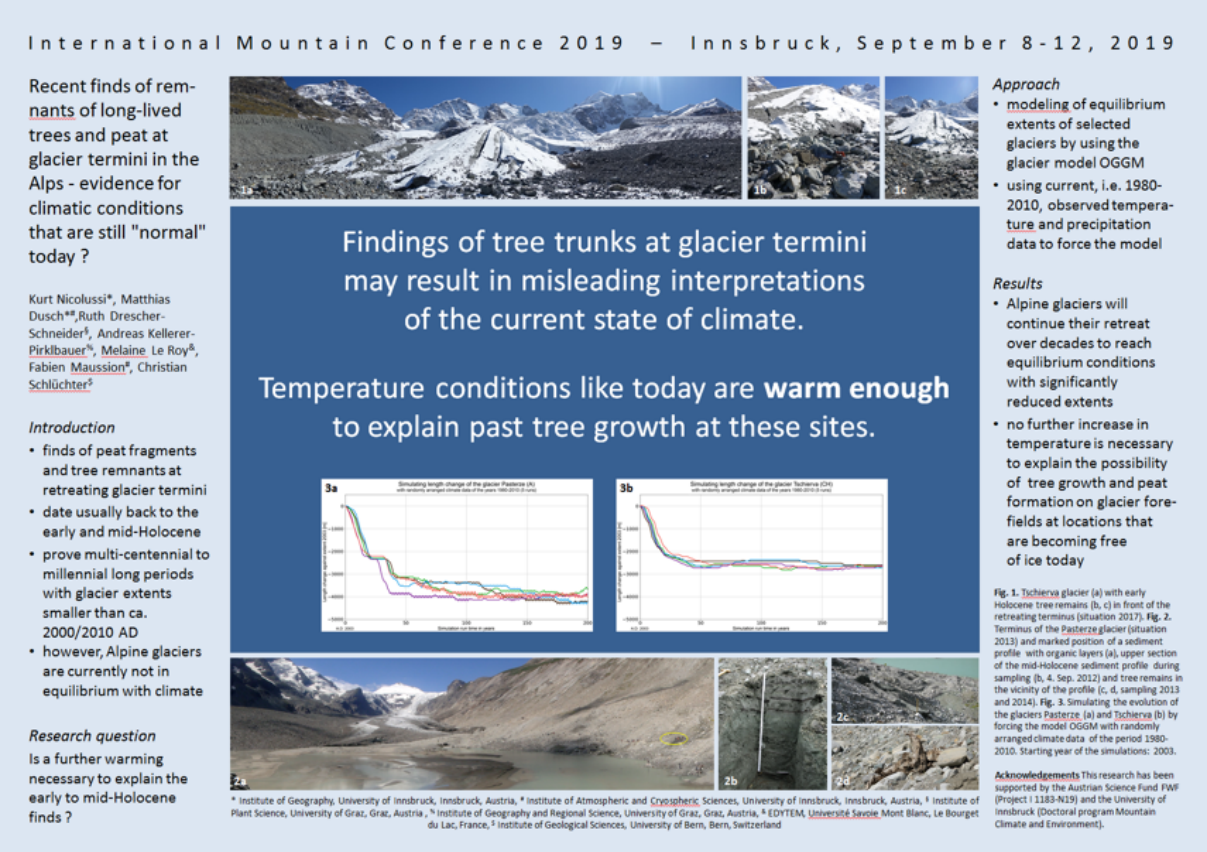

Simulating length change of the glacier Pasterze (A)
with randomly arranged climate data of the years 1980-2010 (5 runs)
Length change against extent 2003 [m]
0
−1000
−2000
−3000
−4000
−5000
0
50
100
150
200
A.D. 2003
Simulation run time in years


Simulating length change of the glacier Tschierva (CH)
with randomly arranged climate data of the years 1980-2010 (5 runs)
Length change against extent 2003 [m]
0
−1000
−2000
−3000
−4000
−5000
0
50
100
150
200
A.D. 2003
Simulation run time in years

Workshop 1.1.C – Poster 1236



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Recent finds of remnants of long-lived trees and peat at glacier termini in the Alps - evidence for climatic conditions that are still "normal" today ?

Kurt Nicolussi*, Matthias Dusch*#,Ruth Drescher-Schneider$, Andreas Kellerer-Pirklbauer%, Melaine Le Roy&, Fabien Maussion#, Christian Schlüchter$

Introduction

- finds of peat fragments and tree remnants at retreating glacier termini
- date usually back to the early and mid-Holocene
- prove multi-centennial to millennial long periods with glacier extents smaller than ca. 2000/2010 AD
- however, Alpine glaciers are currently not in equilibrium with climate

Research question

Is a further warming necessary to explain the early to mid-Holocene finds ?

Findings of tree trunks at glacier termini may result in misleading interpretations of the current state of climate.

Temperature conditions like today are **warm enough** to explain past tree growth at these sites.

Approach

- modeling of equilibrium extents of selected glaciers by using the glacier model OGGM
- using current, i.e. 1980-2010, observed temperature and precipitation data to force the model

Results

- Alpine glaciers will continue their retreat over decades to reach equilibrium conditions with significantly reduced extents
- no further increase in temperature is necessary to explain the possibility of tree growth and peat formation on glacier forefields at locations that are becoming free of ice today

Fig. 1. Tschierva glacier (a) with early Holocene tree remains (b, c) in front of the retreating terminus (situation 2017). **Fig. 2.** Terminus of the Pasterze glacier (situation 2013) and marked position of a sediment profile with organic layers (a), upper section of the mid-Holocene sediment profile during sampling (b, 4. Sep. 2012) and tree remains in the vicinity of the profile (c, d, sampling 2013 and 2014). **Fig. 3.** Simulating the evolution of the glaciers Pasterze (a) and Tschierva (b) by forcing the model OGGM with randomly arranged climate data of the period 1980-2010. Starting year of the simulations: 2003.

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