New paleoelevation constraints on the Mid-Miocene Central Alps

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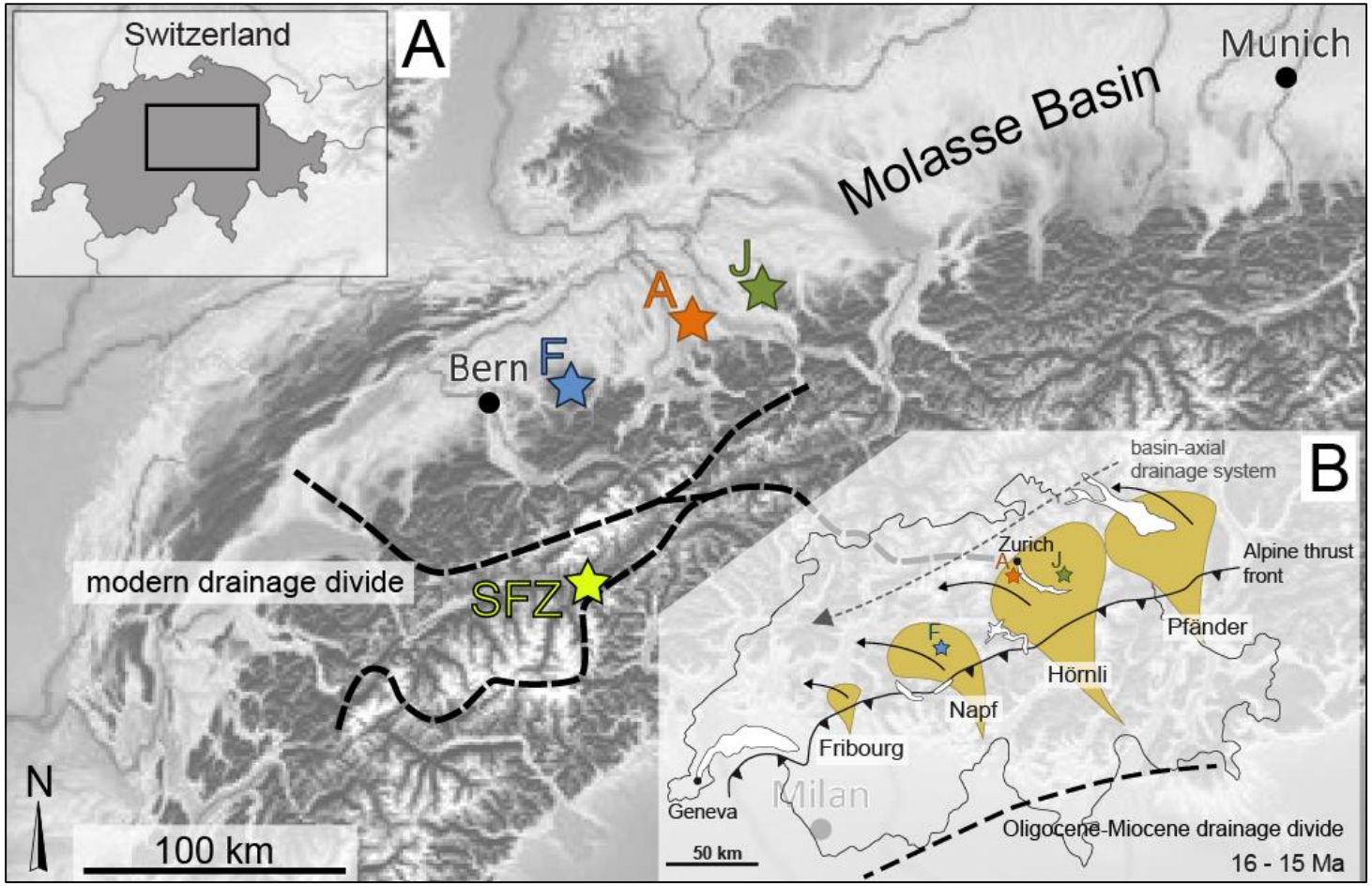
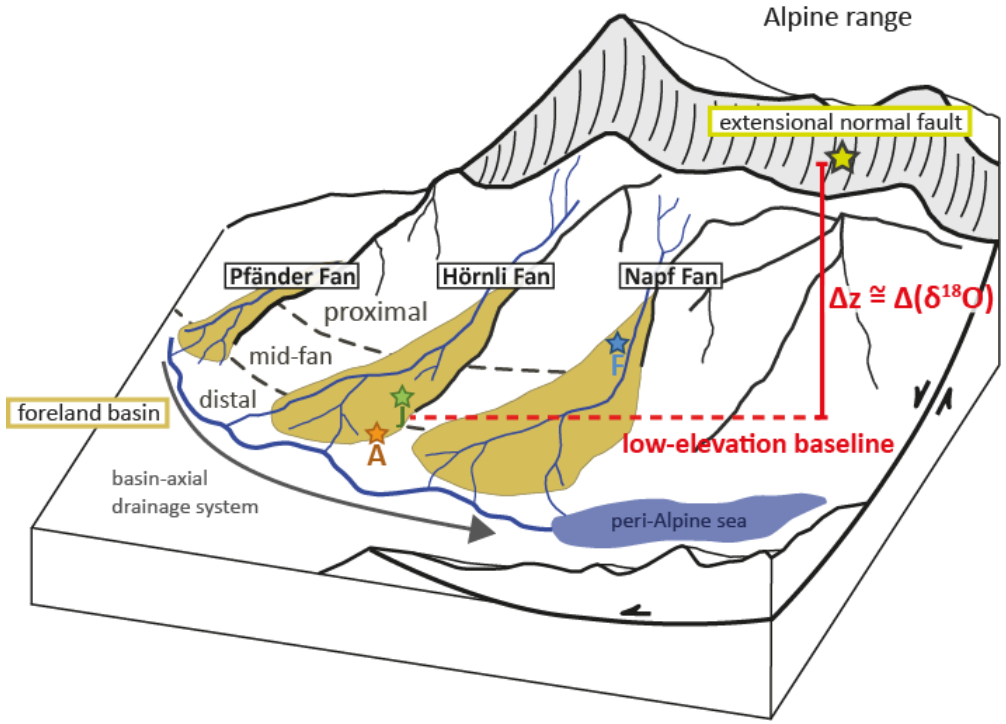
Aim of this study

Provide quantitative paleoelevation estimates for the Mid-Miocene Central Alps



Methods

Stable isotope ($\delta^{18}O/\delta D$) paleoaltimetry on authigenic soil carbonates and hydrous silicates and
Clumped isotopes (Δ_{47}) thermometry



Low-elevation proxies

authigenic carbonate minerals from fossil soils formed in the North Alpine Foreland Basin

Marly horizon with pedogenic overprint

Paleosols with pedogenic carbonate nodules

Carbonate minerals from fossil soils bear the '$\delta^{18}O$ fingerprint' of ancient rainfall, which we use to reconstruct paleoelevations

High-elevation proxies

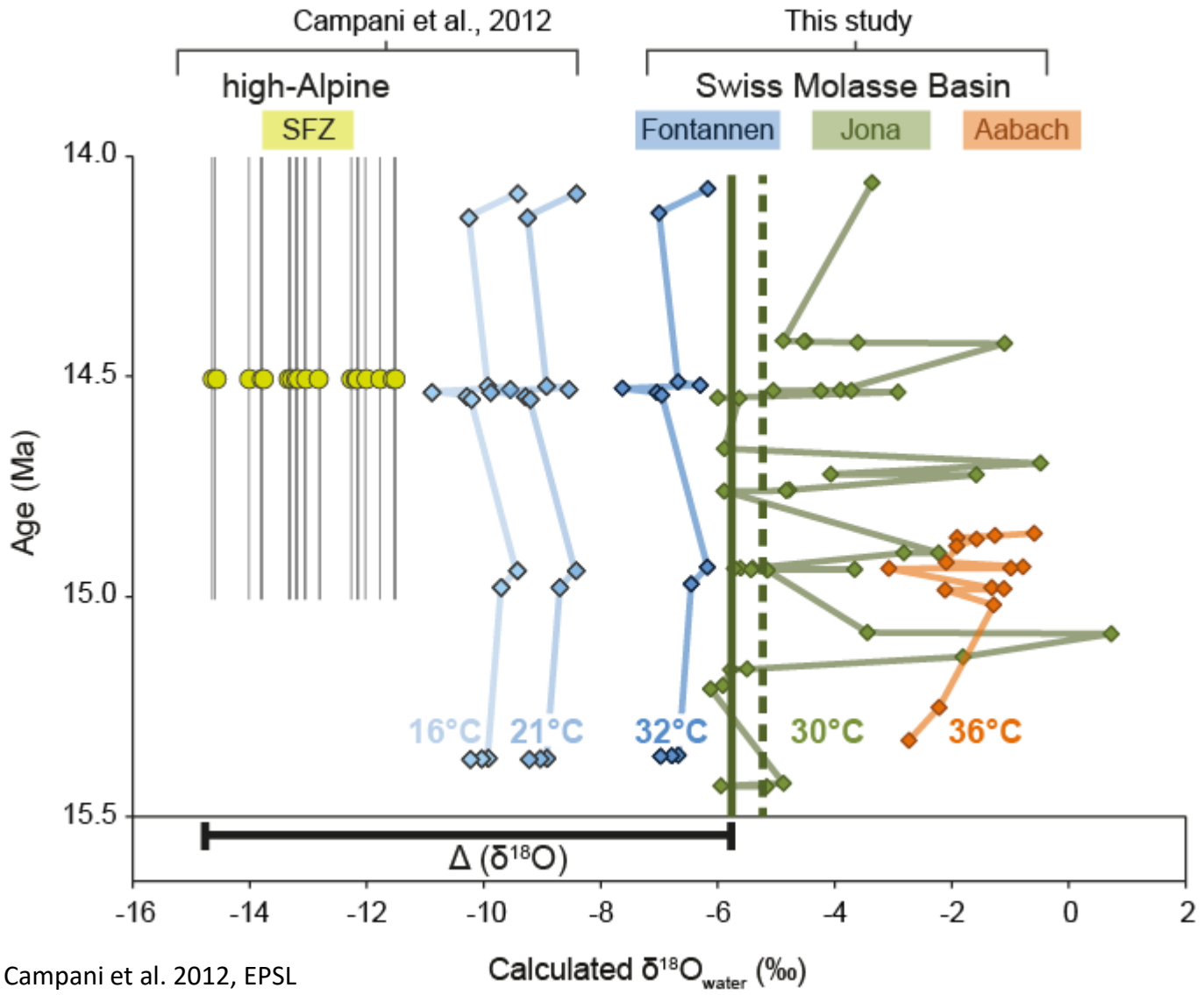
Hydrous silicates from the high-Alpine syntectonic Simplon Fault Zone (SFZ)

High-mountain regions provide hydrous silicates (here: mica layers)

Hydrous silicates from fault zones record δD of rainwater and can be transferred into $\delta^{18}O$

Comparison of the isotopic composition of meteoric waters from low-elevation proxies and age-equivalent high-elevation proxies

$$\Delta Z\ (m) = \Delta\ (\delta^{18}O)$$



Campani et al. 2012, EPSL

Preliminary results

Depending on their setting within the alluvial fans the investigated foreland sections from the NAFB show distinct differences in their $\delta^{18}O$ values.

1) low-elevation distal $\delta^{18}O$ values are higher than previously assumed (based on $\delta^{18}O$ data from low-elevation proximal settings) and thus, more adequately reflect low-elevation $\delta^{18}O$ values required for palaeoelevation estimates

2) Δ_{47} derived carbonate formation temperatures show higher soil temperatures than previously assumed

3) Combination of $\delta^{18}O$ and Δ_{47} low elevation data with high elevation meteoric water proxies (SFZ) result in $\Delta(\delta^{18}O)$ >8 ‰ and argues for mid-Miocene Central Alpine elevations exceeding 4000 m.