Testing the ideal ice-core record for past temperature reconstructions using combined isotope and impurity analyses

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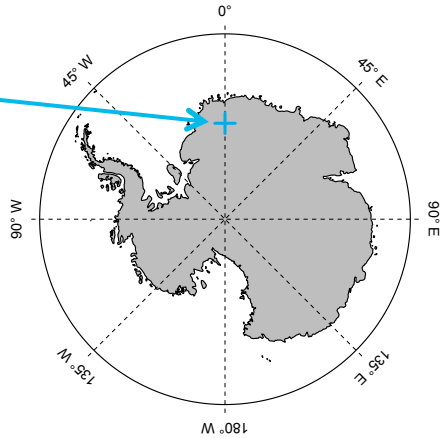
Space-Time Structure of Climate Change

Trench-sampling at Kohnen Station, Antarctica

EPICA EDML site Kohnen Station @ 75 °S, 0 °E.

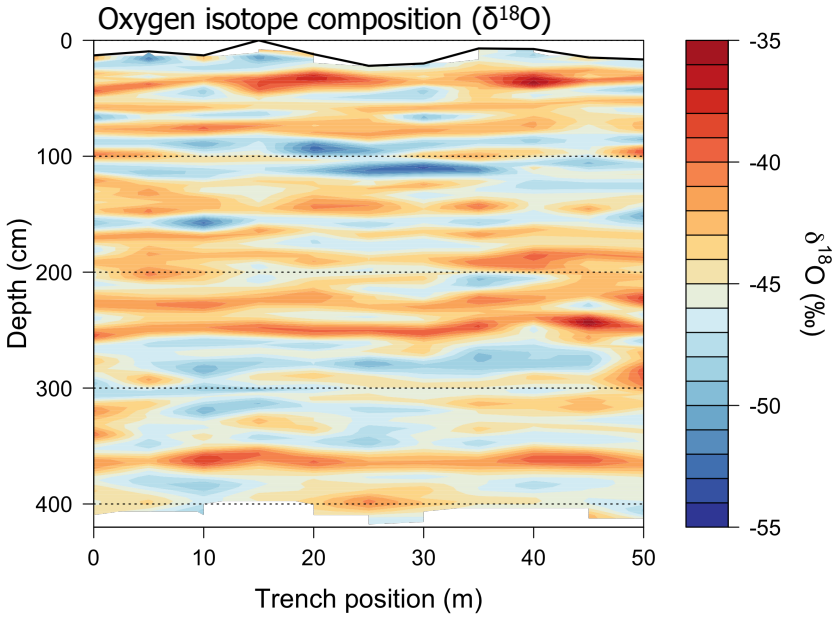
Characterised by

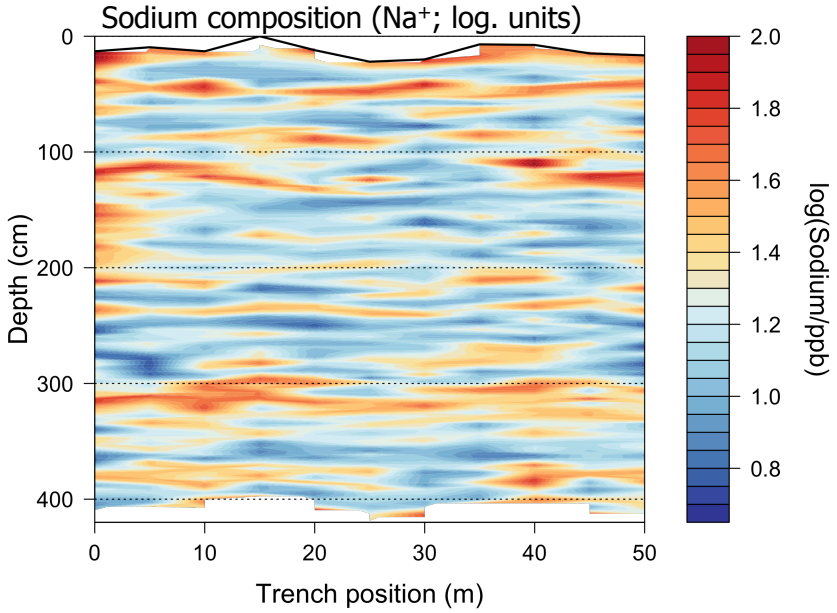
- low accumulation (~ 20 cm snow per year)
- high stratigraphic noise level (Münch et al. 2016, 2017)
- strong noise from precipitation intermittency (Laepple et al. 2018, Casado et al. 2020)



We created **a new trench of 50 m length x 4 m depth** to obtain combined, representative and subannualy resolved profiles of isotope and impurity composition.

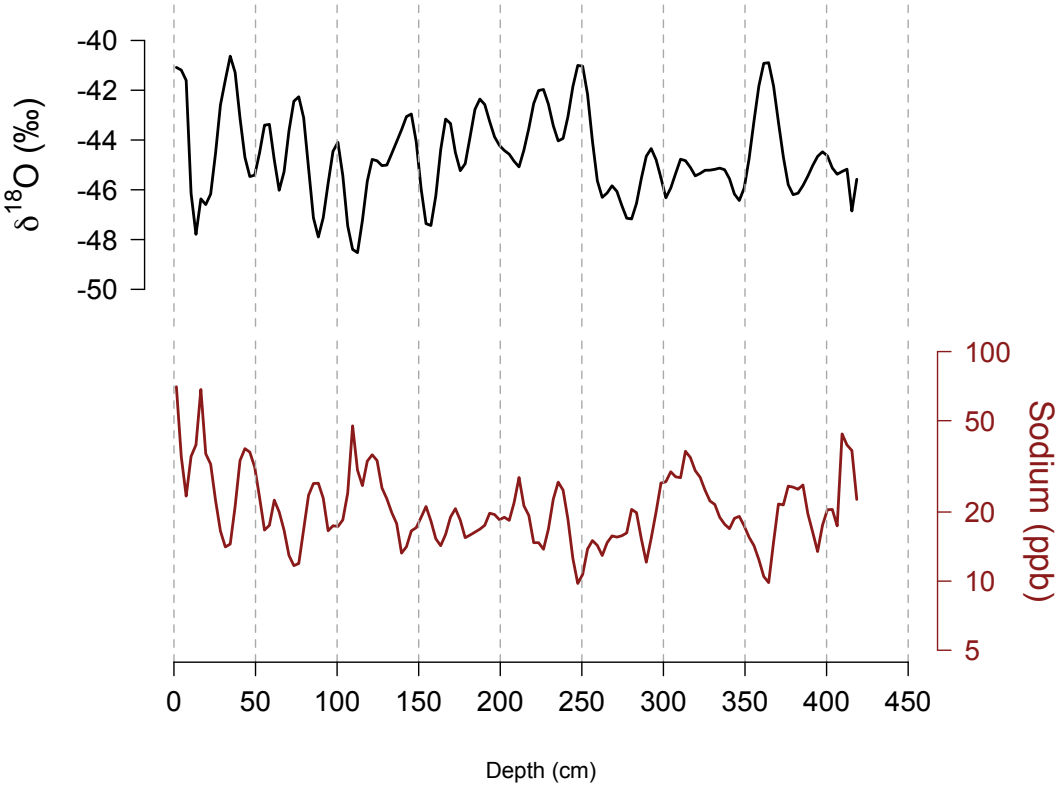
Studying depositional characteristics: 2D view





- The 2D stratigraphy allows testing for a common deposition history.

Studying depositional characteristics: Mean profiles



- Comparison of the trench mean profiles enables us to study the influence of precipitation intermittency:
  - strong isotopic maxima (summer) coincide with very low Na^+ concentration.
  - weak isotopic maxima tend to occur with strong Na^+ signals.

First tentative results…

- Residual 2D stratigraphy around the mean profiles suggests a common redistribution:
  - positive correlation between $\delta^{18}O$ and Na^+ residuals
  - however weak: ~ 0.3
  - what explains the remaining variability around the mean?
- Preliminary dating (layer counting) suggests a link between the summer signals:
  - strong negative correlation (~ –0.75) observed between isotopic and Na^+ summer signals
  - this could indicate the strength of the intermittency of summer precipitation.
- Extending these analyses can potentially yield a way to actively reduce the intermittency noise and so improve isotope-based temperature reconstructions.