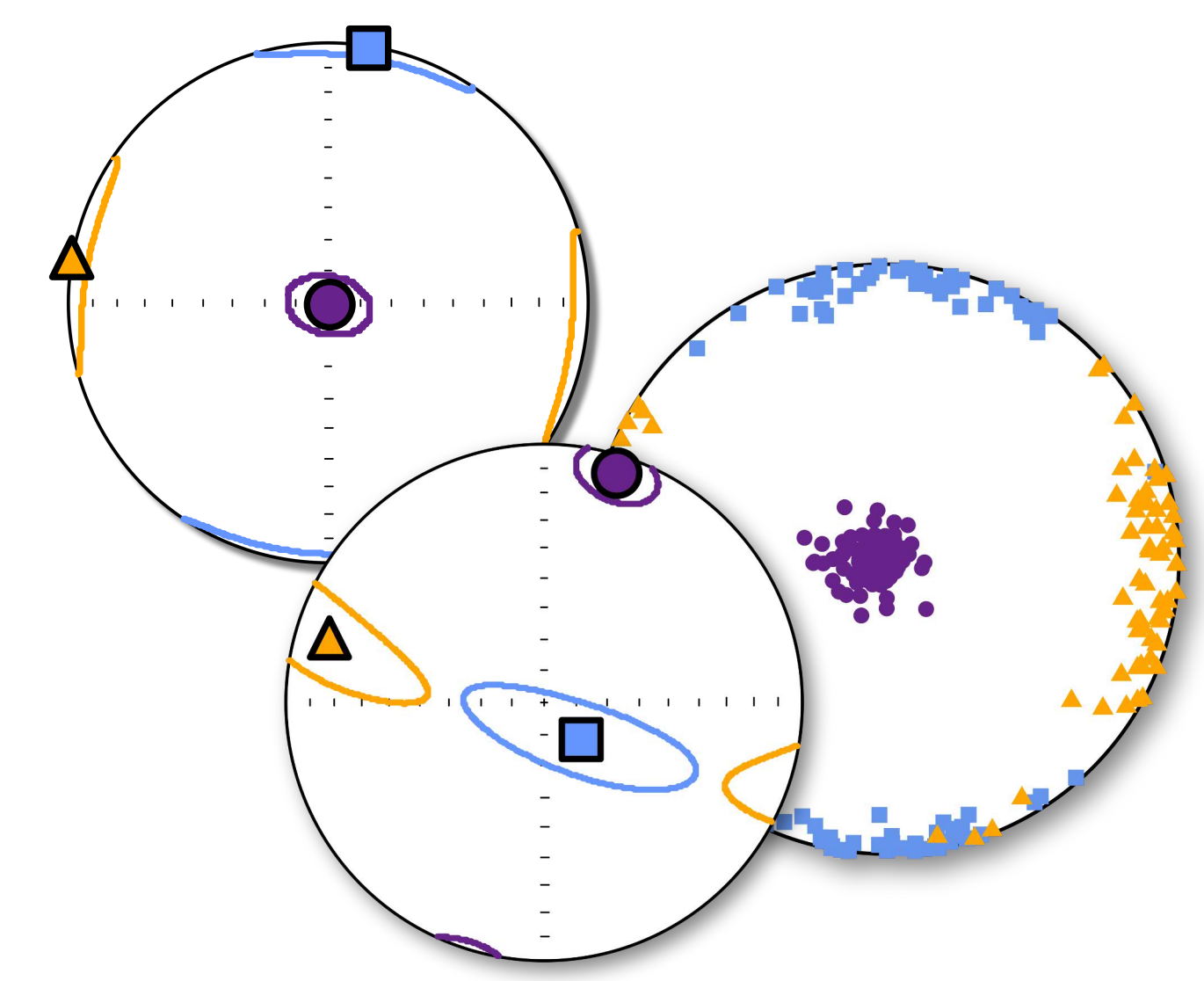




Magnetic fabric of Tajik loess-palaeosols as a **palaeowind** and process indicator

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Motivation

The **Afghan-Tajik Basin** has been periodically populated for at least the last 800,000 years. Stone tools that were left by these **hominins** are embedded in loess-palaeosol sequences that record **dust events** of the last 2.7 Million years. Here we investigate loess-palaeosol sections spanning the lastest **1.2 Million years**.

Did the local and synoptic-scale wind patterns change over that time?

Caspian-Sea-Hindu-Kush-Index drives dust transport into the Afghan-Tajik Basin, mostly during the hot, dry summer period. Regional orography steers winds inside the basin.
Kaskaoutis et al. (2016) 10.1016/j.gloplacha.2015.12.011
Li et al. (2022) 10.1016/j.gr.2022.04.019

CasHKI

Conceptual model of dust transport on the Khovaling Loess Plateau

Are we sure that AMS records wind directions?

Yes! We have independent evidence:

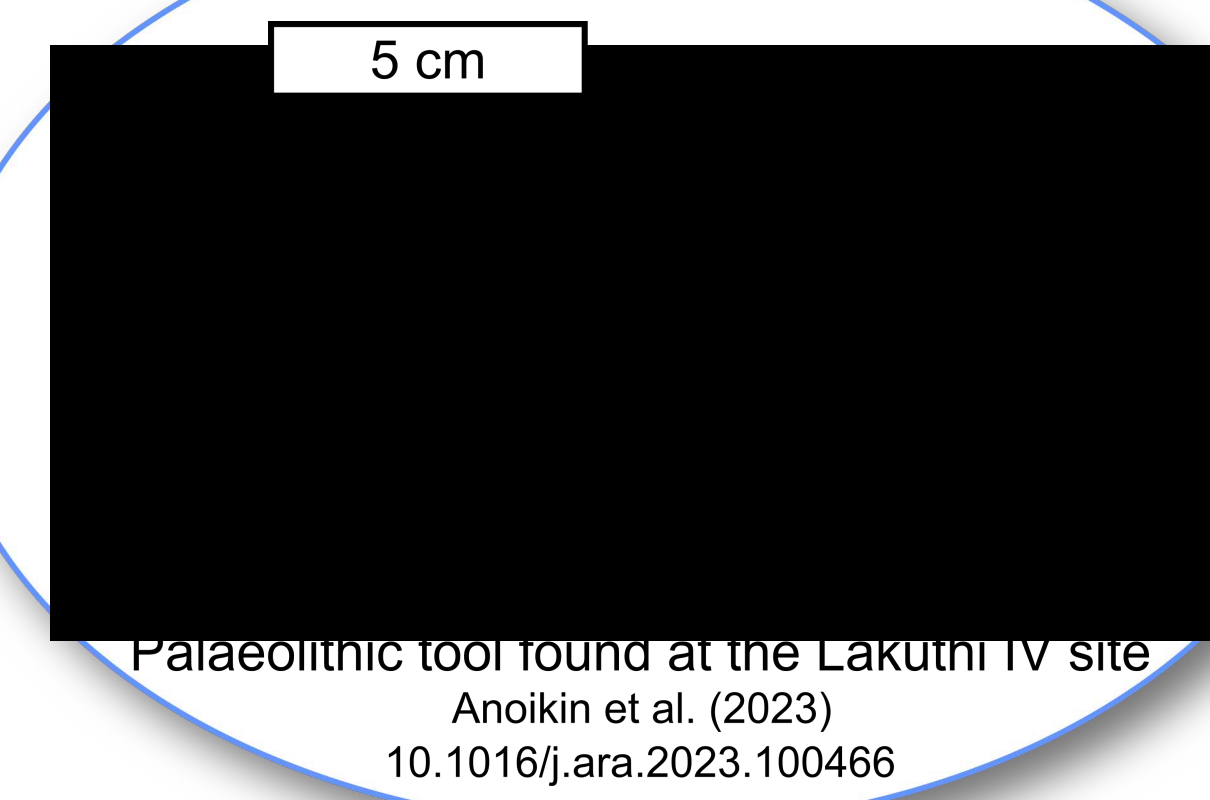
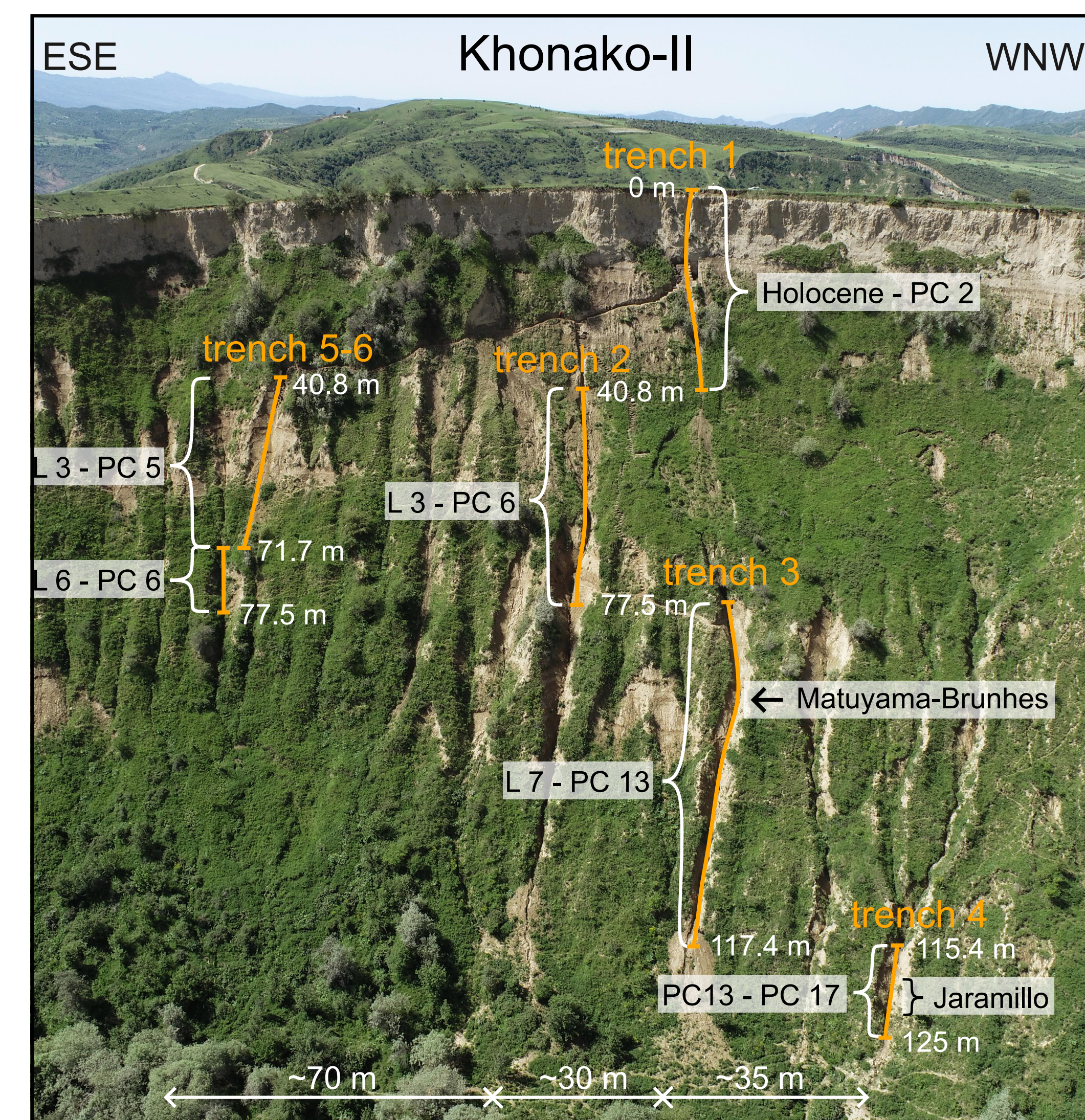
- 1 Samples collected from the same unit, but from different trenches (70 m apart), and measured in different laboratories, show **consistent fabrics**
- 2 Field observations and frequency-dependent AMS confirm **minimal postdepositional reworking** for Khonako-II and Kuldara
- 3 Postdepositional **reworking can be identified** in the magnetic fabric. We see evidence of reworking at the landslide-affected site Obi-Mazar

Palaeoclimate implications

River-proximal sites are more likely to record winds steered by valley topography. **Ridge-locations** preserve directional signal of long-range dust transporting winds

Stable dust-transporting winds in the Afghan-Tajik Basin over the last 1 Million years

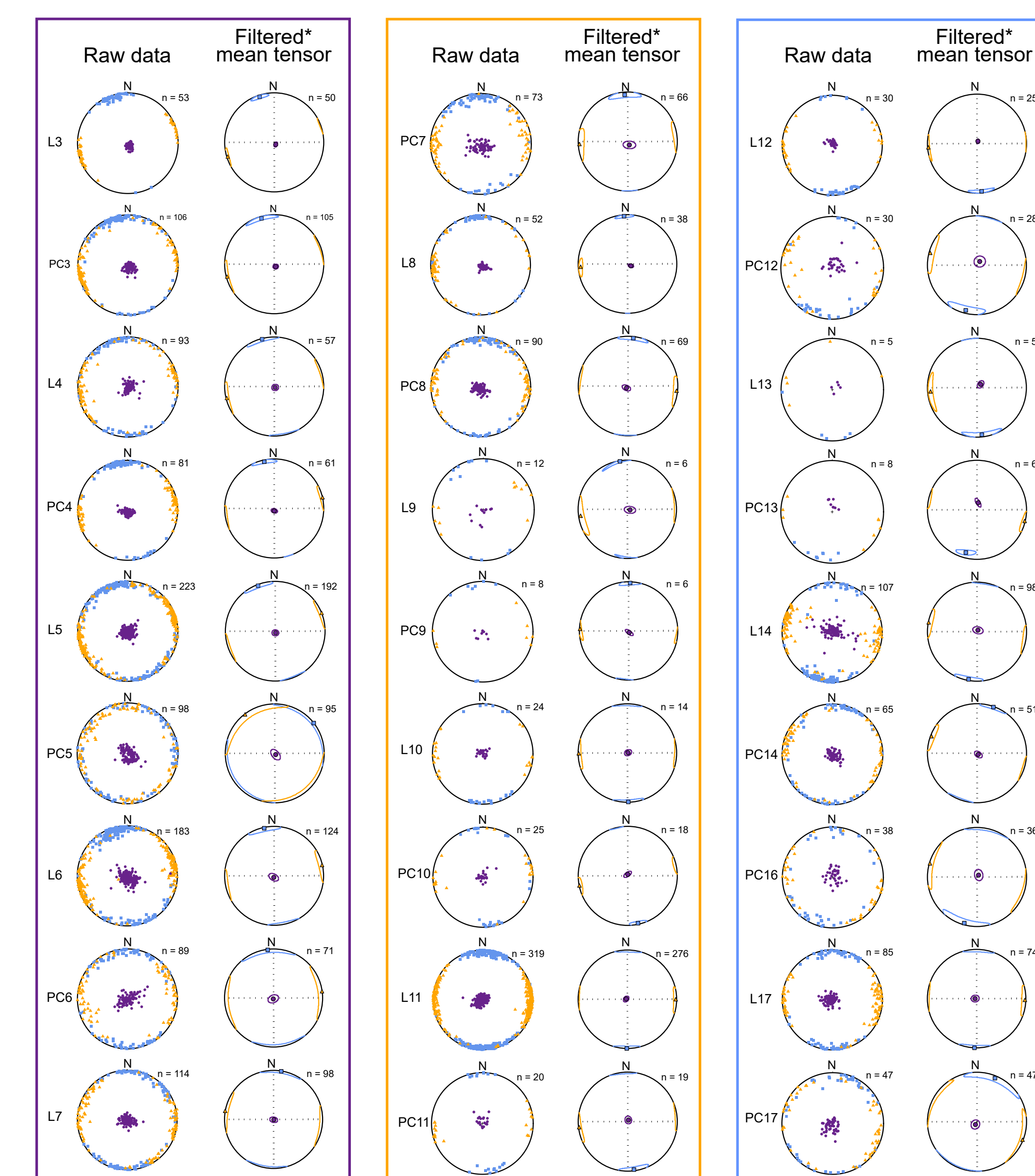
Site



Palaeolithic tool found at the Lakutni IV site
Anolik et al. (2023)
10.1016/j.ara.2023.100466

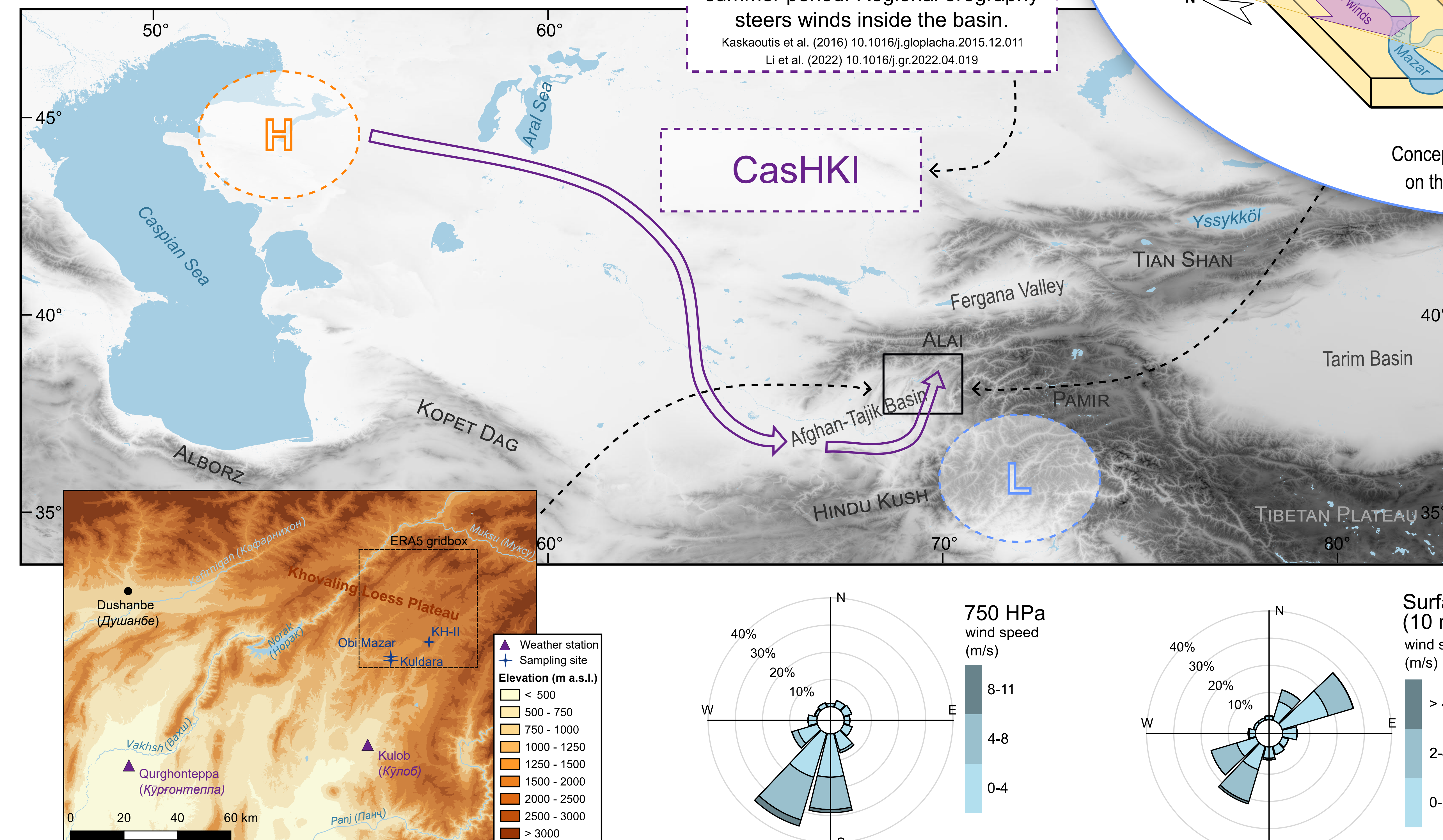
AMS results

Anisotropy of magnetic susceptibility (AMS) measured at 976 Hz and 200 A/m



* Statistical filtering: E12 < 22.5, F12 > 4.3, F23 > 10

Wind observation & reanalysis data



Wind directions at **750 hPa** are steered by regional orography. Winds during **dust events** blow from **south / southwest**.

Wind speed at **10 m** height controlled by **valley topography**. Winds from SW are overrepresented during **dust events**.

Data: ERA5. Dust event onset dates during 2011-2022, recorded at Kulob meteorological station