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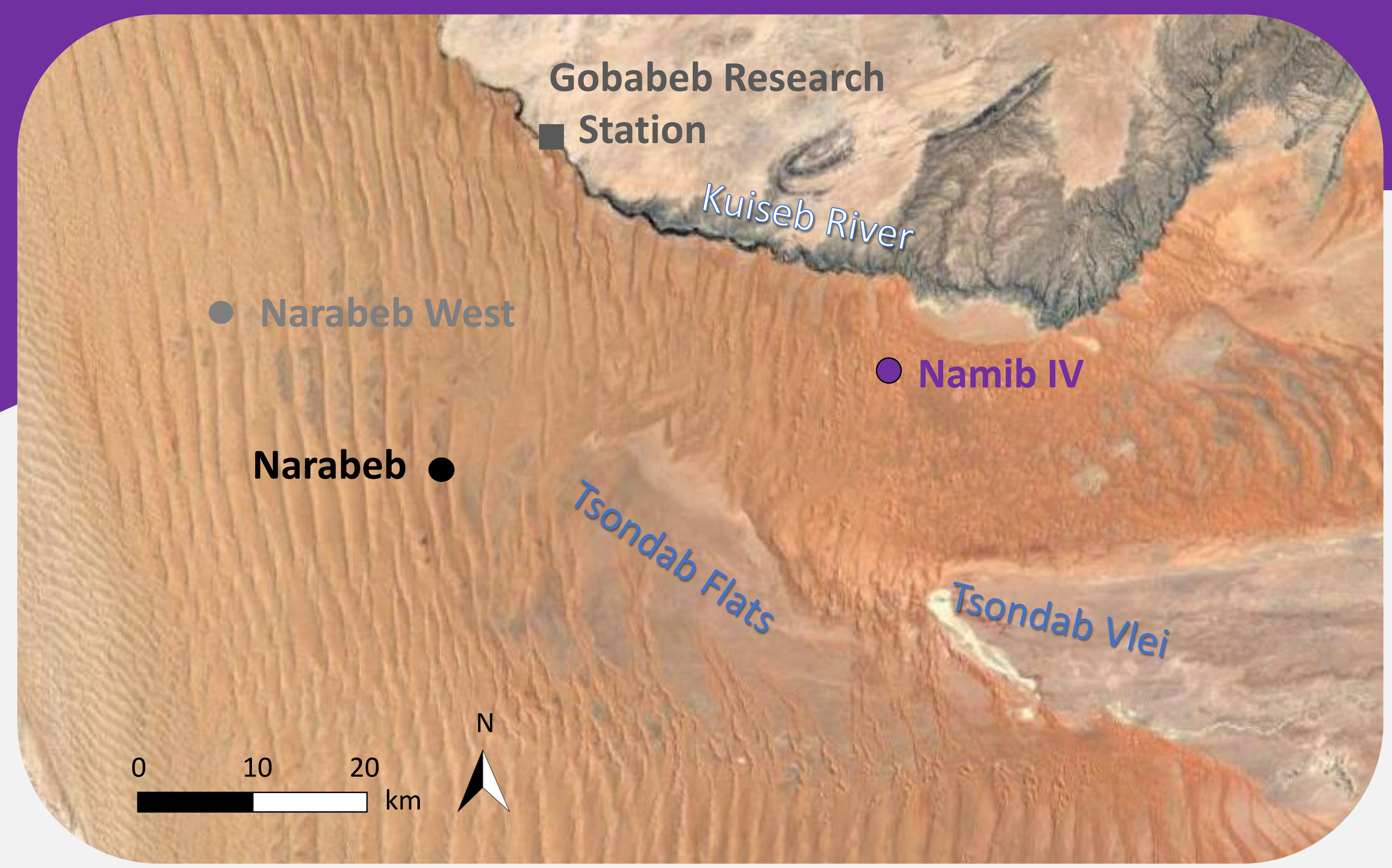
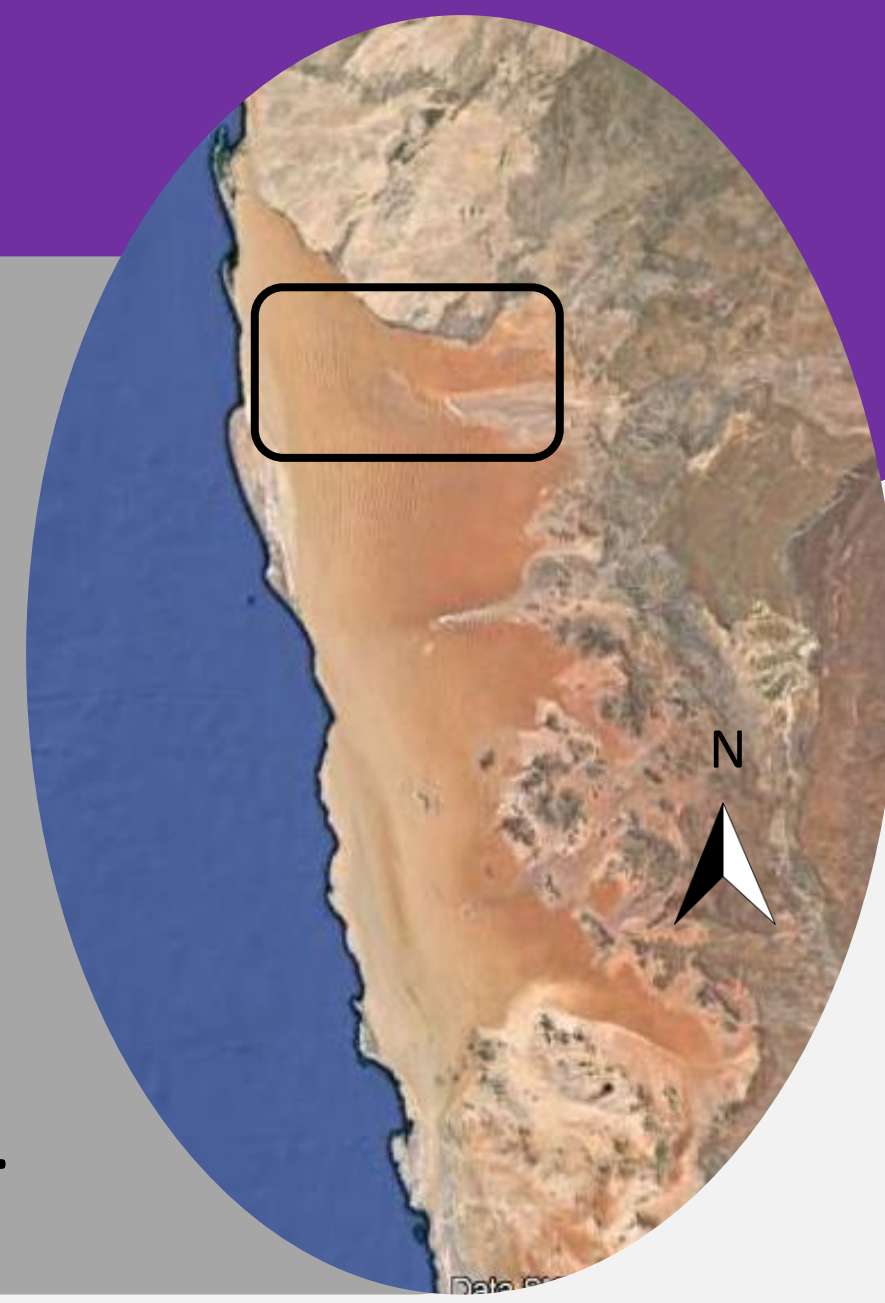


Dating Hominin occupation of the north of the Namib Sand Sea, Namibia

Abi Stone^{1*}, Dominic Stratford², Ted Marks³, Rachel Bynoe⁴, Kaarina Efraim⁵, Eugene Marais⁶, Rachel Smedley⁷, George Leader^{8,9,2}

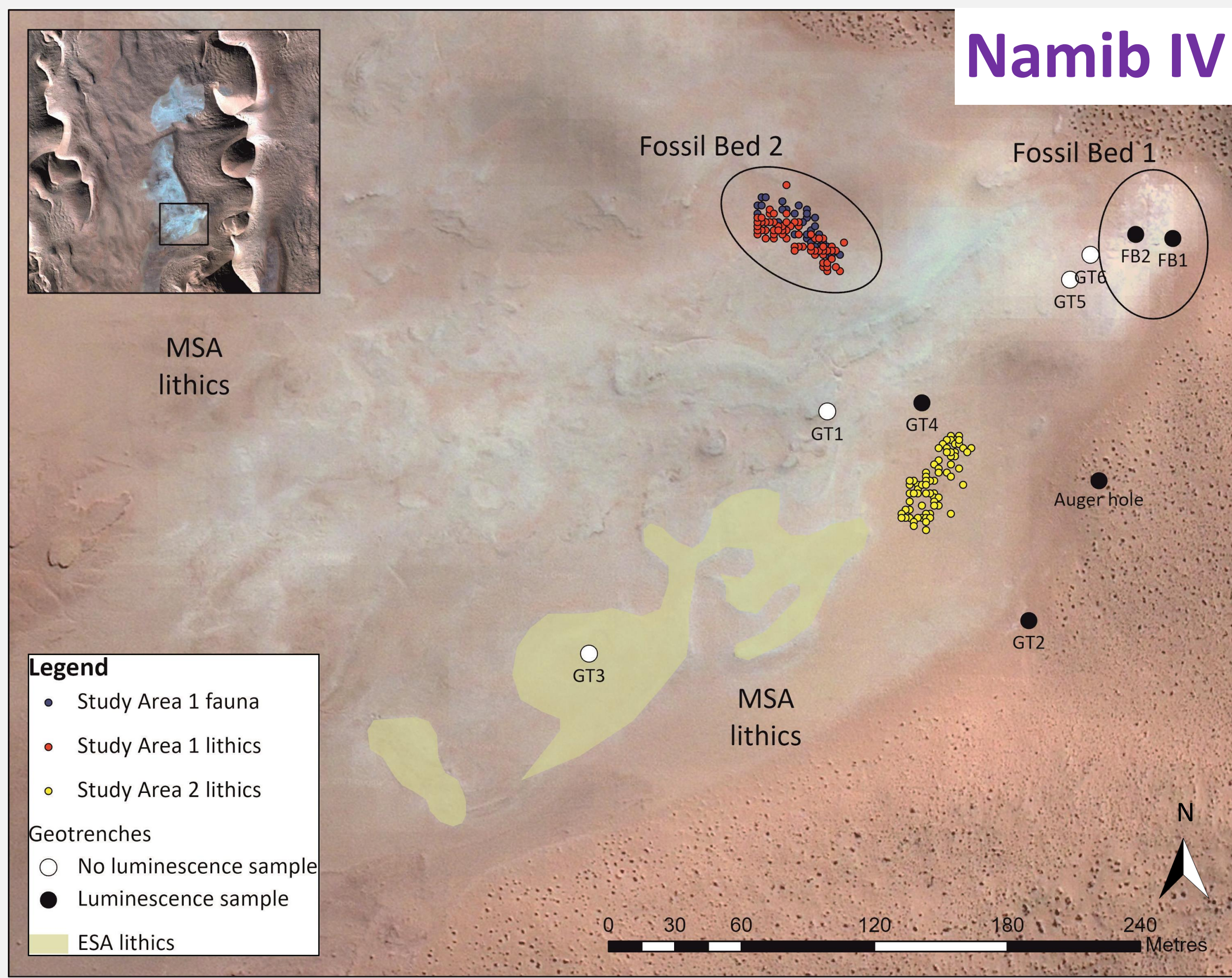
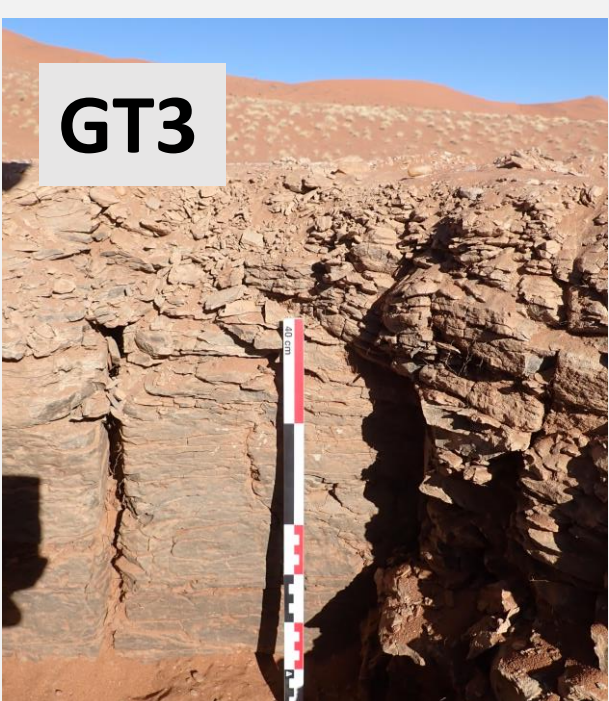
Context

- Early and Middle Stone Age (ESA & MSA) lithics attest to repeated hominin occupation over ~300 ka, and potentially 1 Ma, in the now hyper-arid Namib Sand Sea landscape.
- Did hominins adapt to marginal environments, or was the palaeoenvironment different?
- Sampling undertaken for a luminescence chronology.



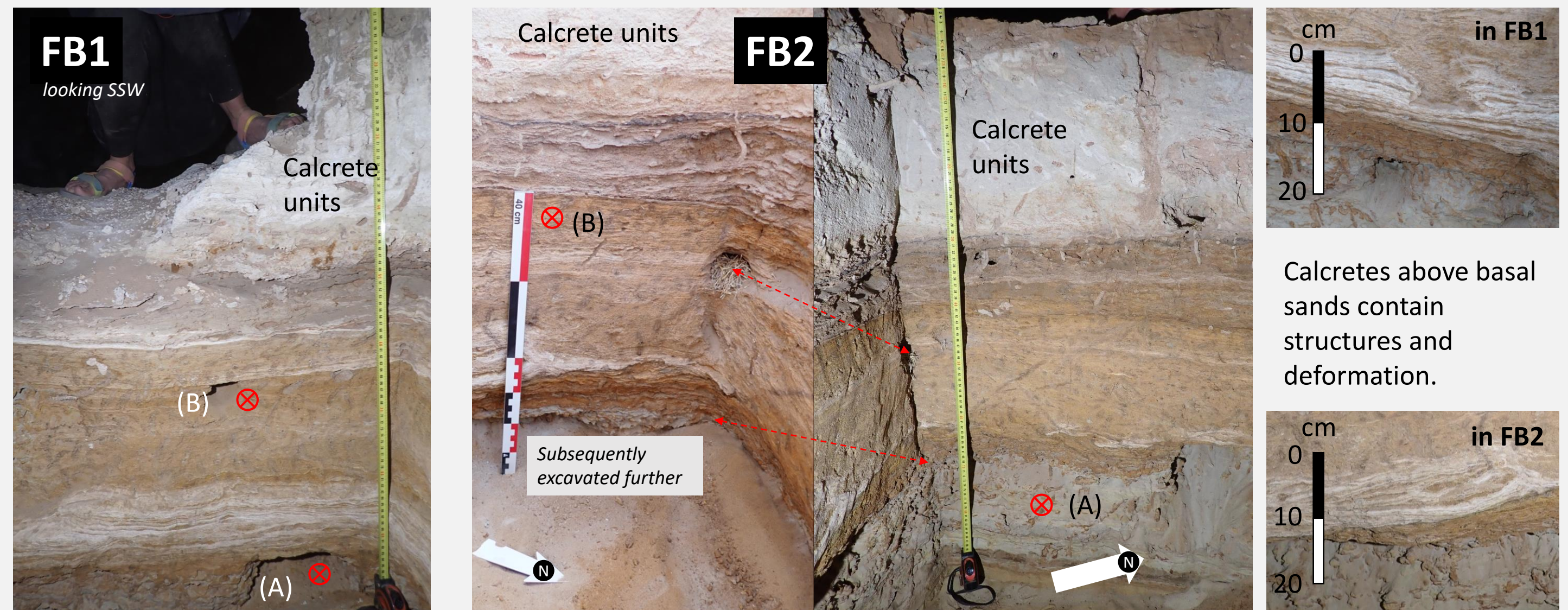
Mudstones, capped at **GT1** with sandstone (incl. calcretes) record standing water then drying.

- All very consolidated, and could be part of Palaeogene Tsondab Sandstone Formation^[1]
- Not targeted for dating.



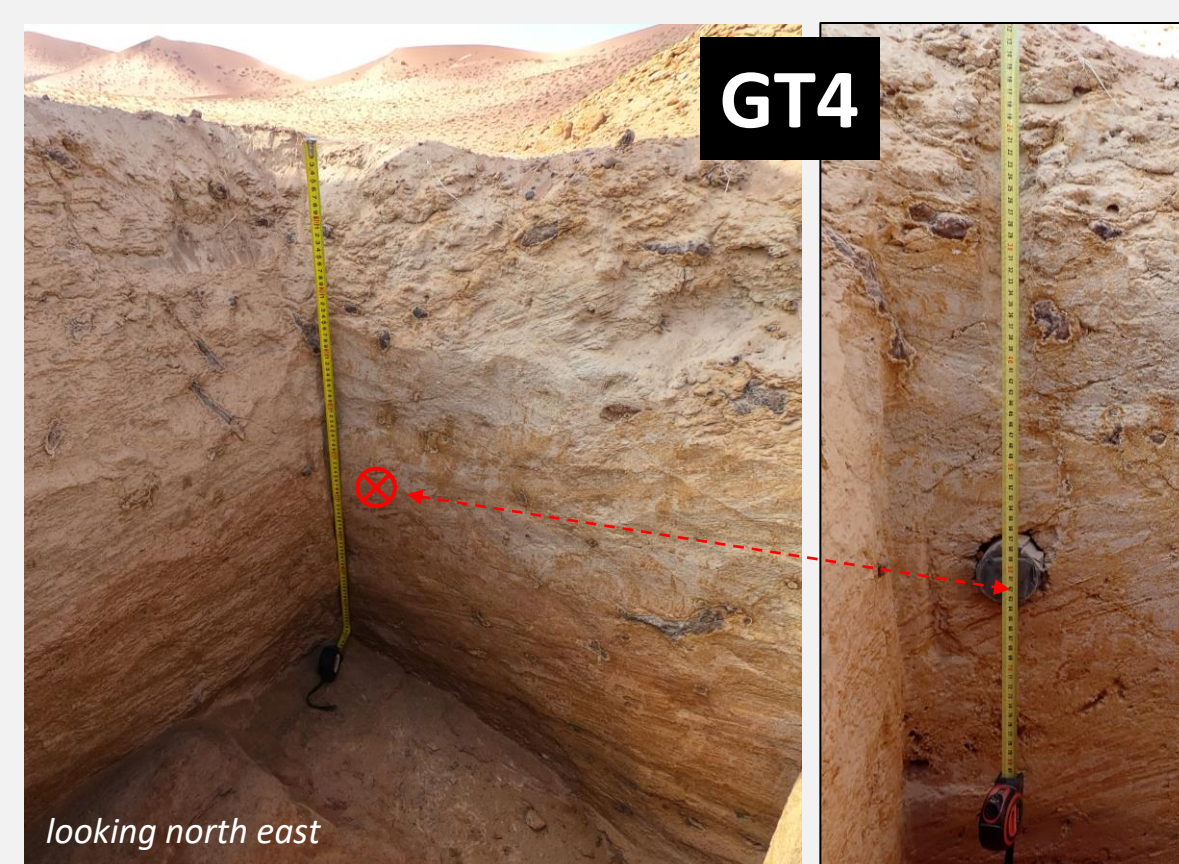
Map of **Namib IV** showing: (i) distribution of lithics and fossil fauna in 2022 survey, (ii) the spatial concentration of ESA lithics (yellow shading) observed in 2021, and (iii) location of 2022 geotrenches to investigate palaeoenvironmental conditions (where solid circles indicate sampling for dating). [data sources: ESRI, Google Earth, Copernicus Sentinel data 2022, projection WGS 1984]

Luminescence sampling



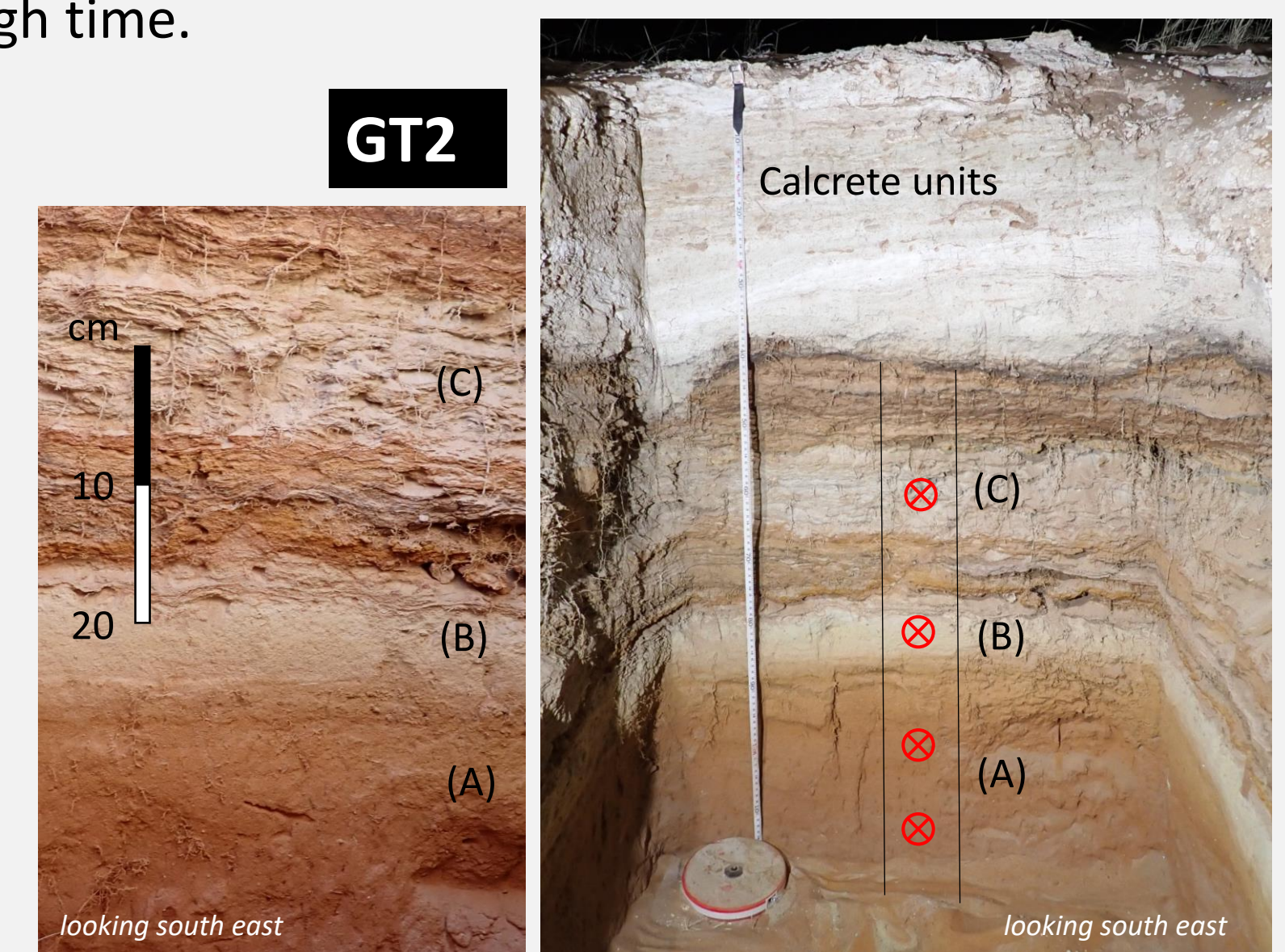
Near-horizontal sands and banded calcretes at **Fossil Bed 1** record varying moisture availability through time.

Sampled (A) basal sands (massive, unconsolidated, with stained root casts), (B) upper sands (thin bedding, varied colour layers, overprinted root casts).



Cross-bedded sands above mudstone at **GT4** record dune migration after drying.

Sampled in the middle of the cross-bedded sands. These dip NNW, and angle varies from 16° to 20°.



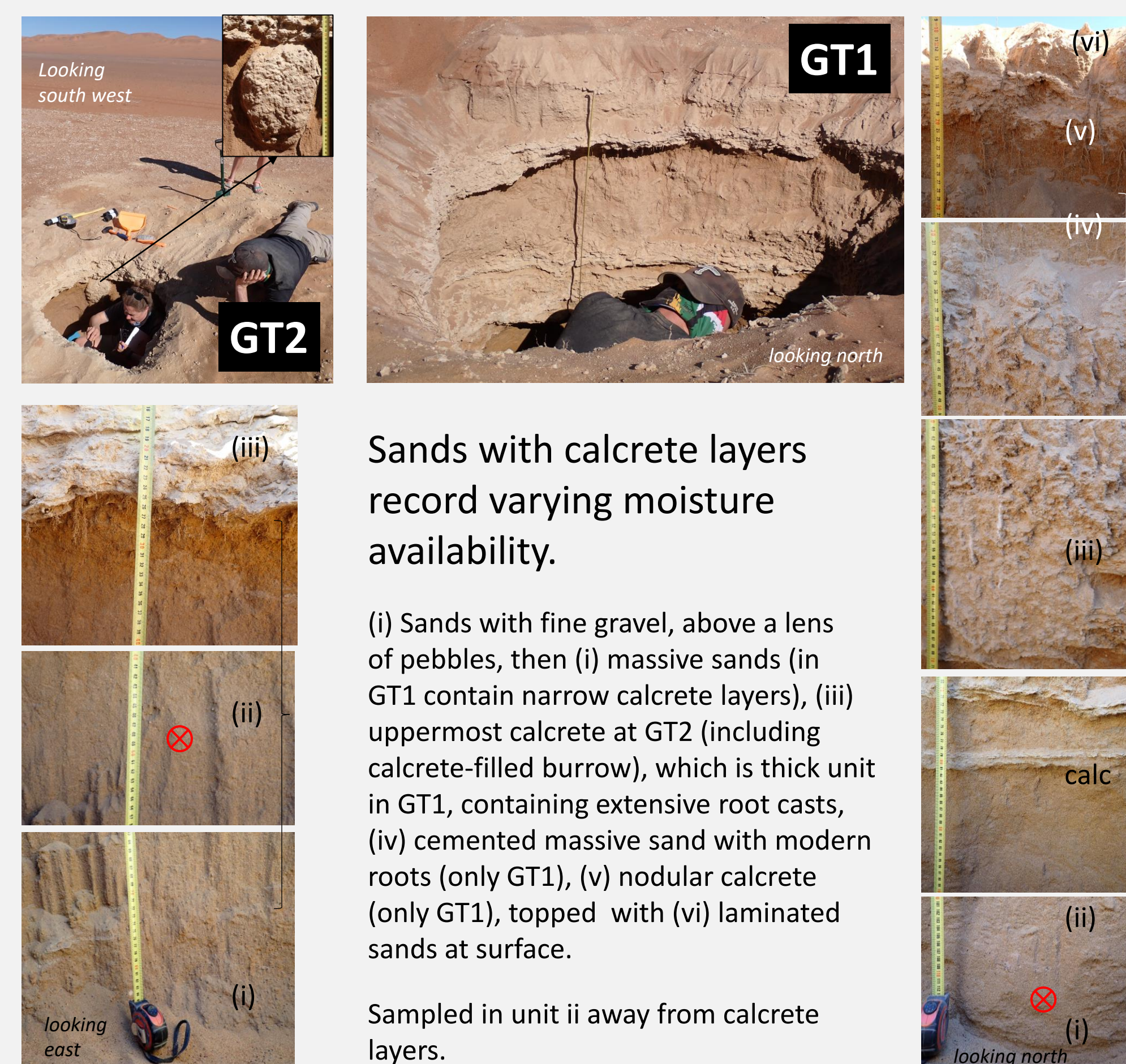
Massive sands, thin-wavy bedded sands, capped with calcrete in **GT 2**, similar to Fossil Bed 1.

Sampled: (A) basal massive yellowish-red sand, (B) massive fine white sand & (C) white bedded sands with red-yellow laminations.

Narabeb

Luminescence sampling

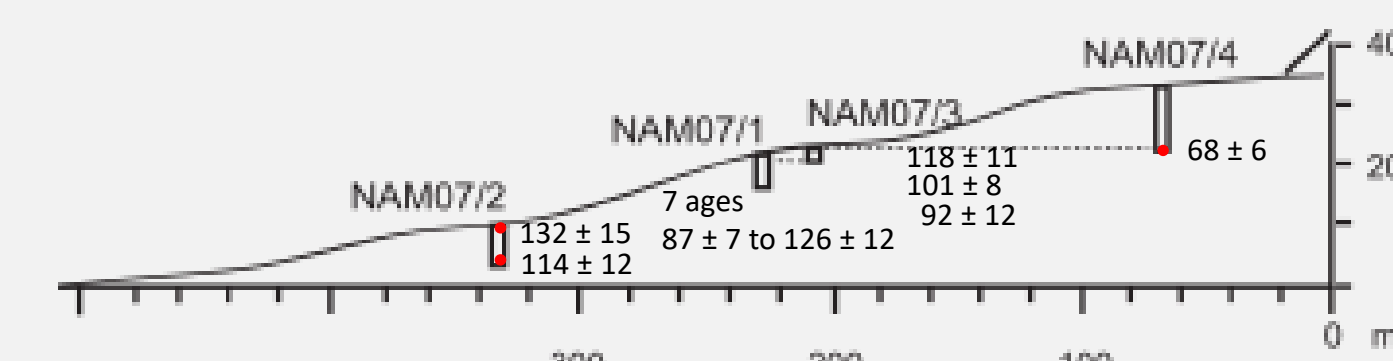
Two auger sites and two geotrenches targeted in 2022.



Fluvial cobbles to south and north of the Narabeb pan.



Existing quartz OSL chronology for interbedded aeolian and water-lain units: ponding ~110 ka^[2] but quartz is near saturation.



Findings...

...next steps

Namib IV

- Multiple occupations (ESA & MSA) at pan during multiple wetter phases, from W-E river (Kuiseb interdune flooding less likely).
- Complex pan topography associated with different lithic technology and sediments.
- Ancient Tsondab Sandstone Formation at GT1 & GT3, whilst unconsolidated sands (GT4, cross-bedded), alternating with calcretes (FB1, GT2), likely Quaternary-aged.
- Lithic raw material source = Kuiseb River.

A digital elevation model to help here

Further geotrenches

IRSL dating target samples

Narabeb

- Vast interdune landscape with low-density MSA. Source = cobbles of ancient Tsondab River.
- Quaternary ponding in topographic low-point, carved by former ancient course of the Tsondab River, with fluvial cobbles to N and S.

IRSL dating, and link to 2007 chronology.

Narabeb West

- MSA observed at this westerly site, also part of former Tsondab River course(s).
- Numerous pans observed on route.

Choose lithic survey sites and sampling

The challenge of linking subsurface chronology and sedimentary palaeoenvironmental record with surface lithics finds...

Acknowledgments and references

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[1] Ward, J.D. (1984) Eolian, fluvial and pan (playa) facies of the Tertiary Tsondab Sandstone Formation in the central Namib Desert, Namibia. *Sedimentary Geology* 55, 143-162.
 [2] Stone, A., Thomas, D.S.G., Viles, H.A. (2010) Late Quaternary palaeohydrological changes in the northern Namib Sand Sea: New chronologies using OSL dating of interdigitated aeolian and water-lain interdune deposits. *Palaeogeog Palaeoclim, Palaeoecol* 288, 35-53.

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