Fluvial-aeolian interactions and sand provenance in large African sand seas (Sahara and Kalahari)

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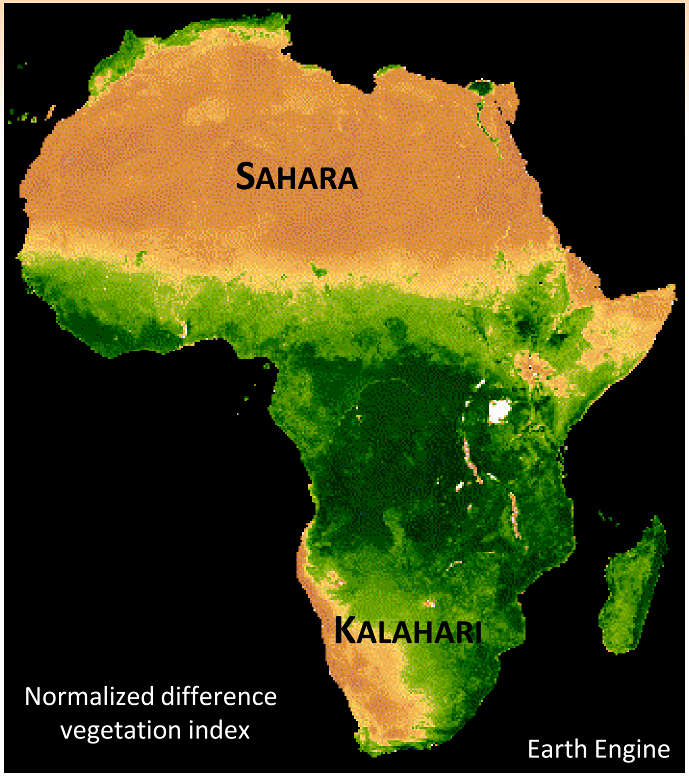
INTRODUCTION

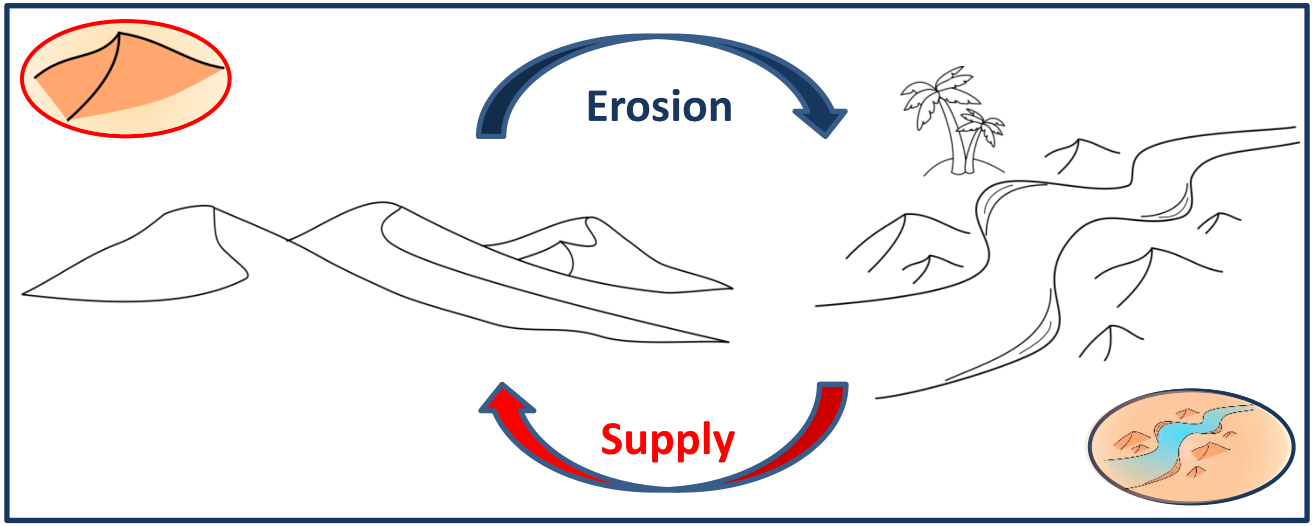
African deserts are huge continental sedimentary basins:

- *What **provenance** information they preserve?*
- *What **climatic** information they preserve?*

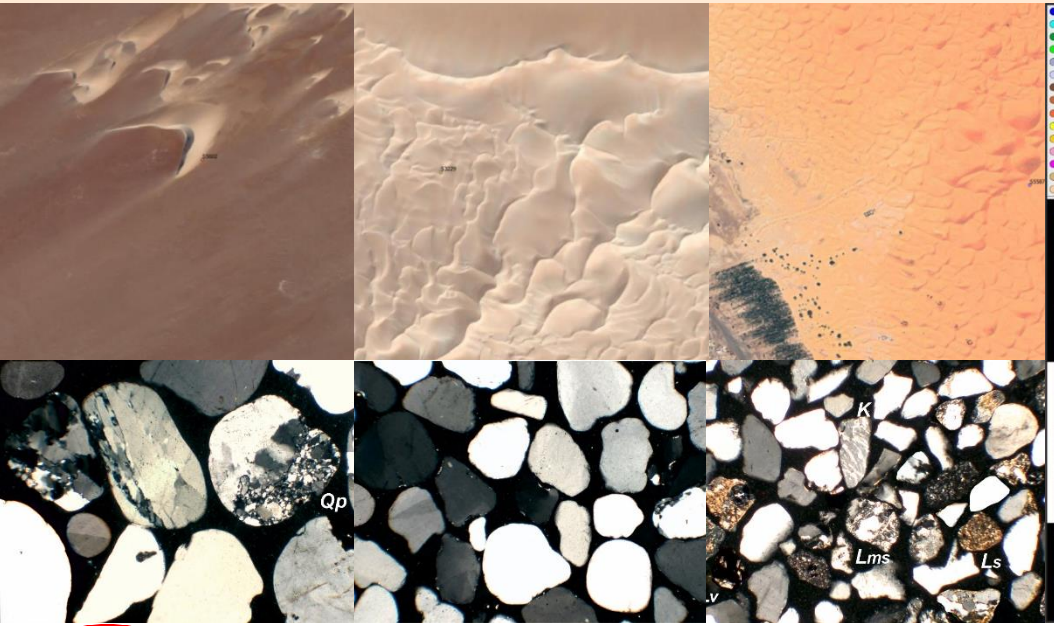
Interaction with present and past **fluvial networks**:

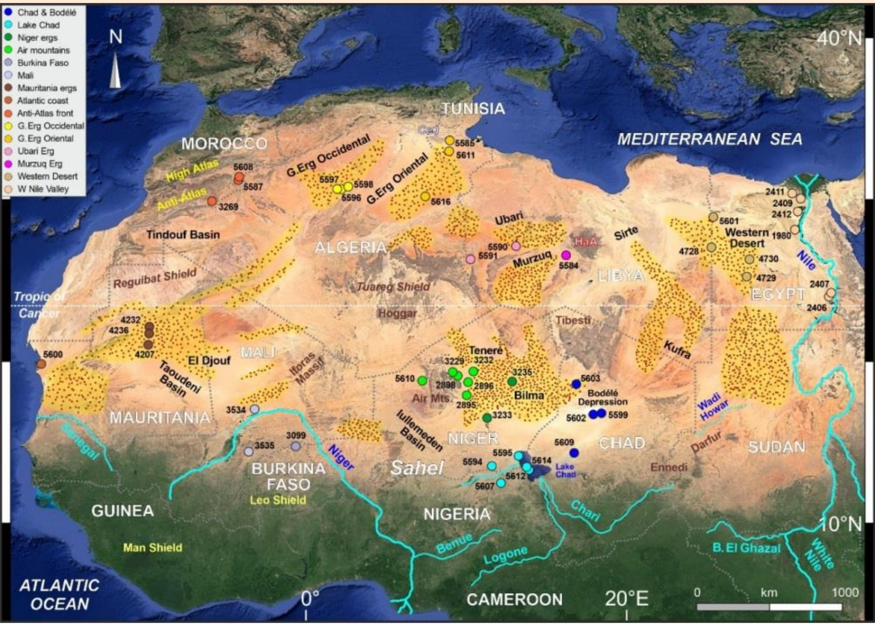
- *What controls this interaction **globally**?*
- *What can we infer from the **geological record**?*

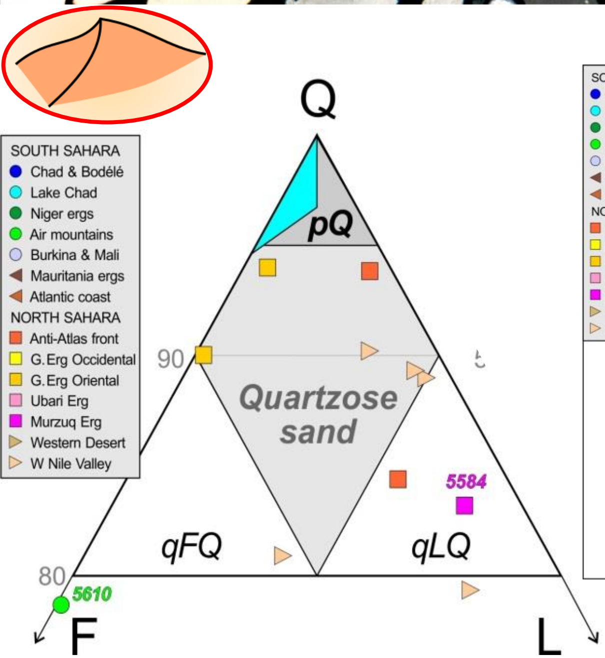


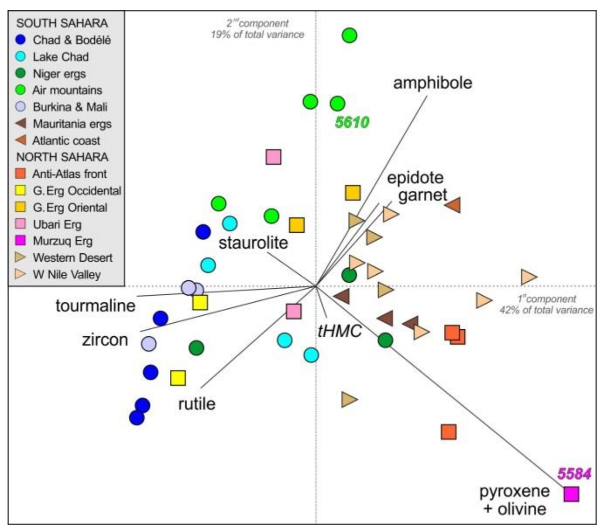


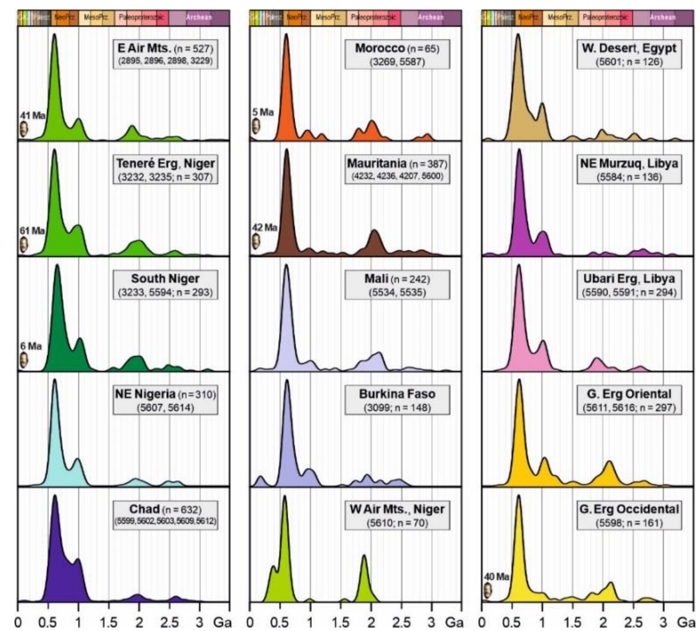
SAHARA





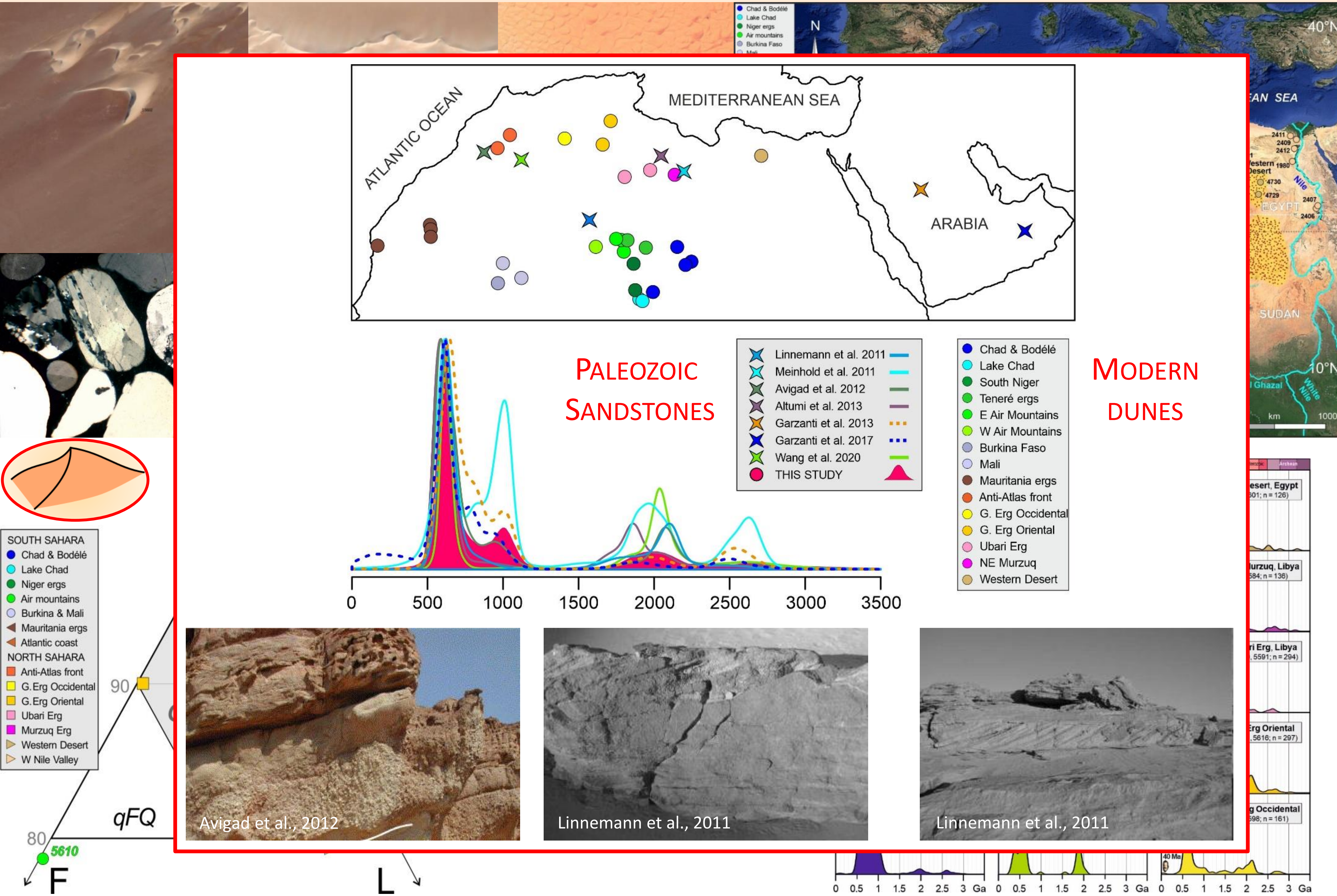






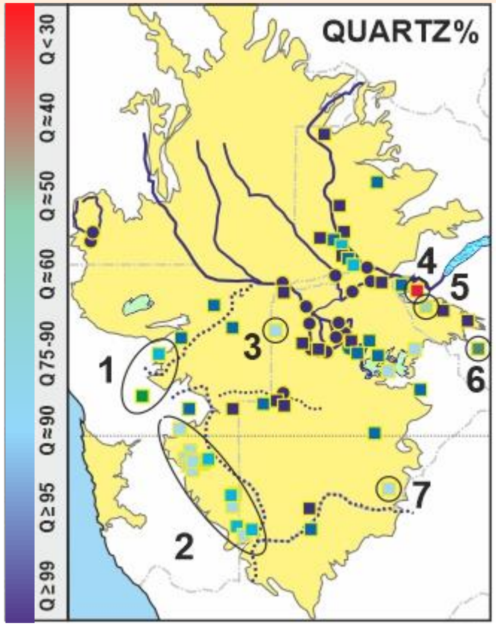
Pastore et al., 2021

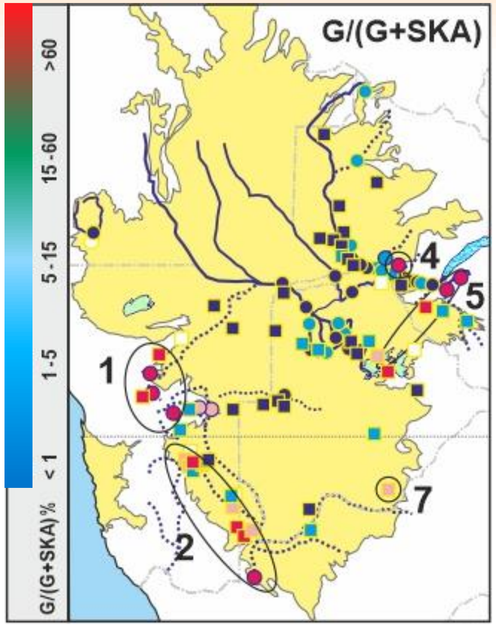
SAHARA

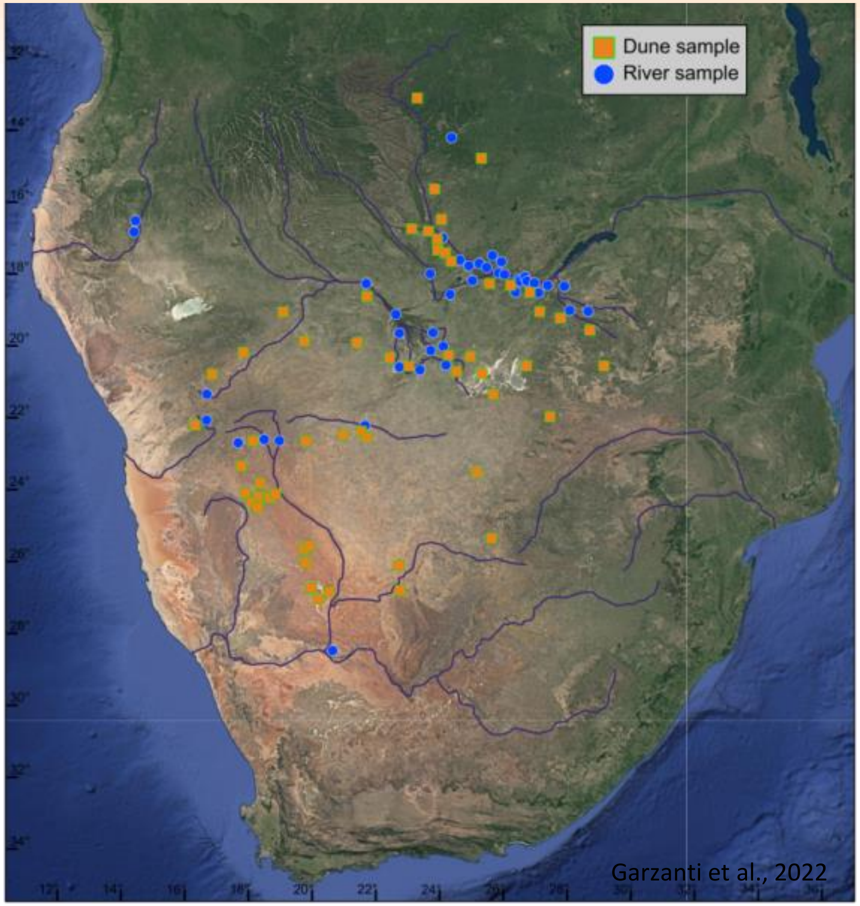


Pastore et al., 2021

KALAHARI





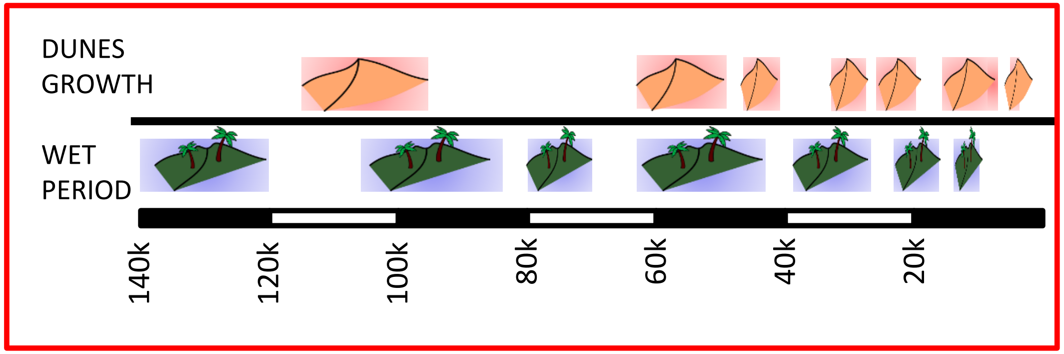


Chemical indexes

- Extreme CIA/WIP ratio.
- Kaolinite 42% in Okavangango – 36% in Zambezi River Mud
- Zr= 87±53 ppm in dunes Hf= 2±1 ppm in dunes (UCC standard 190 and 6)

Weathering indexes typical of multiple humid climatic period rathe than arid environments.

QUATERNARY WET PERIODS



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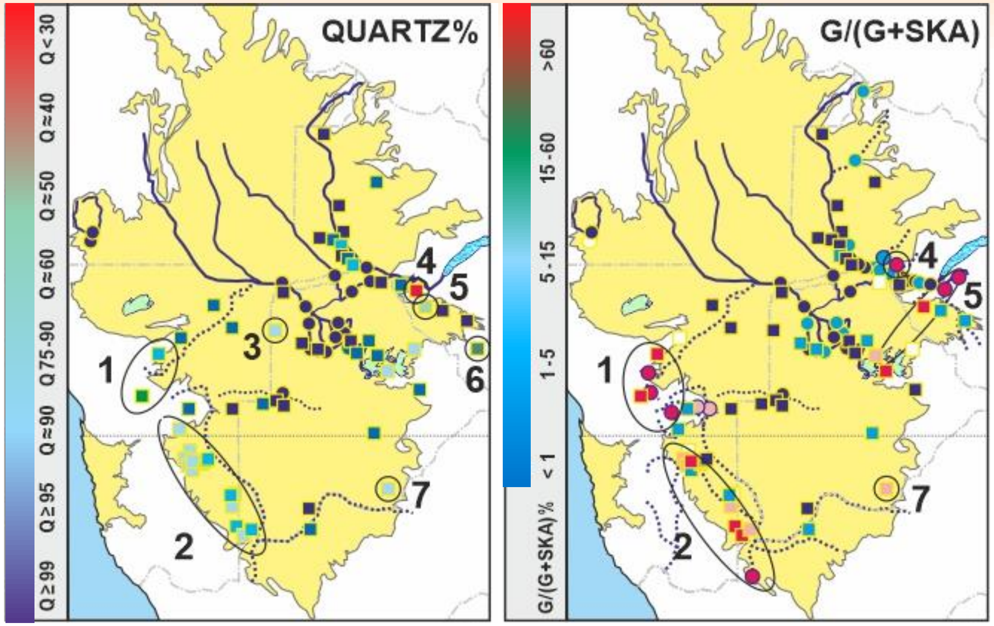

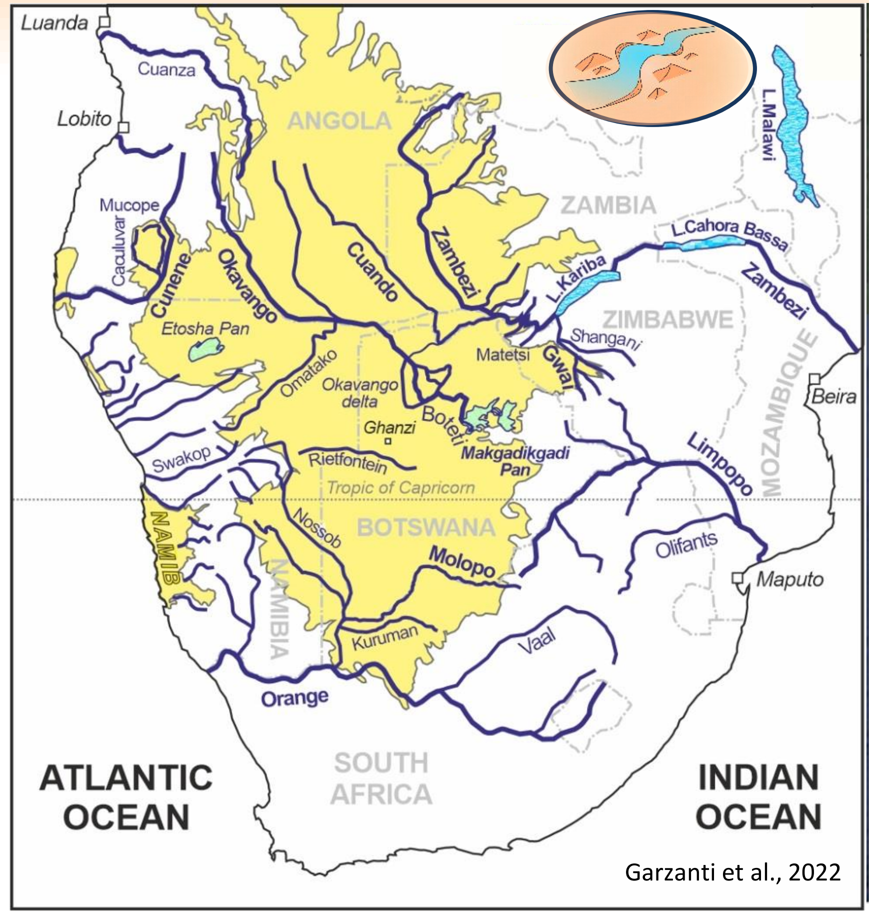

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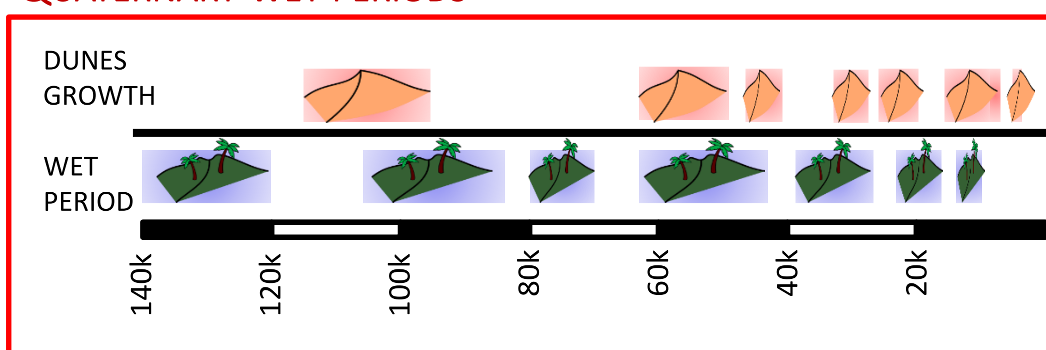

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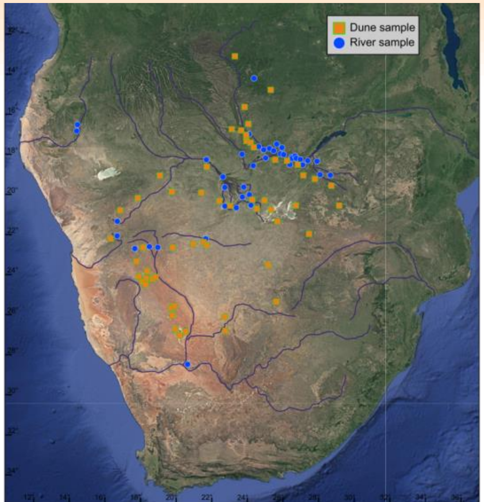
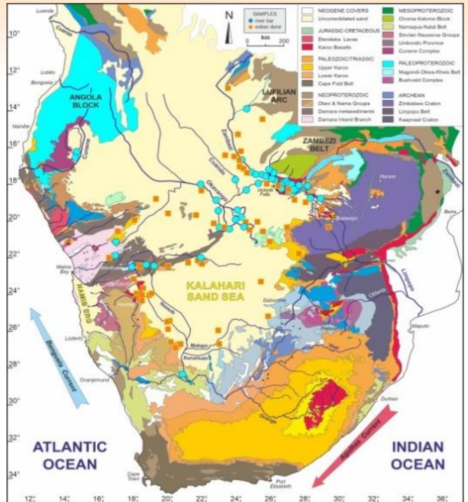
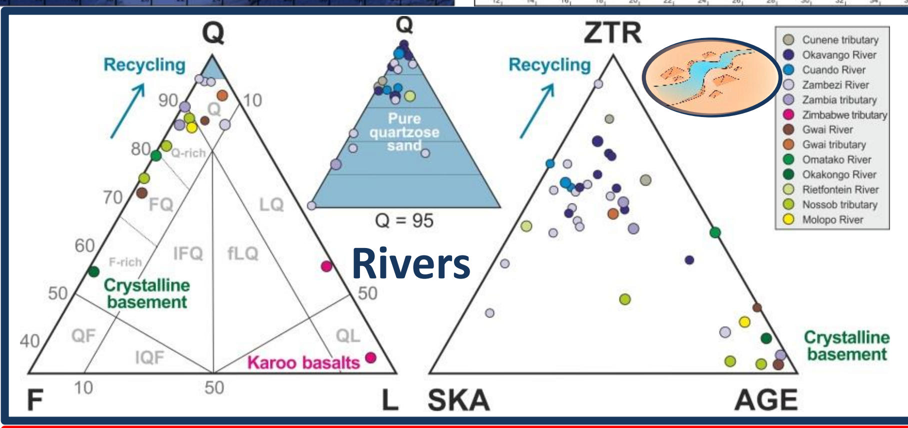
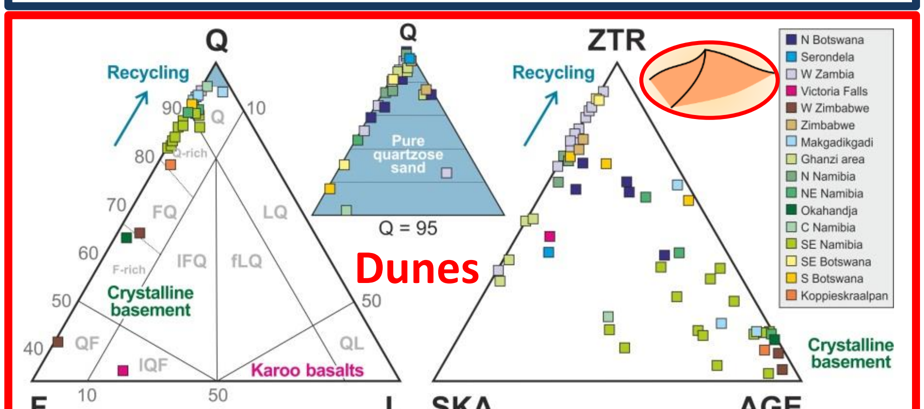
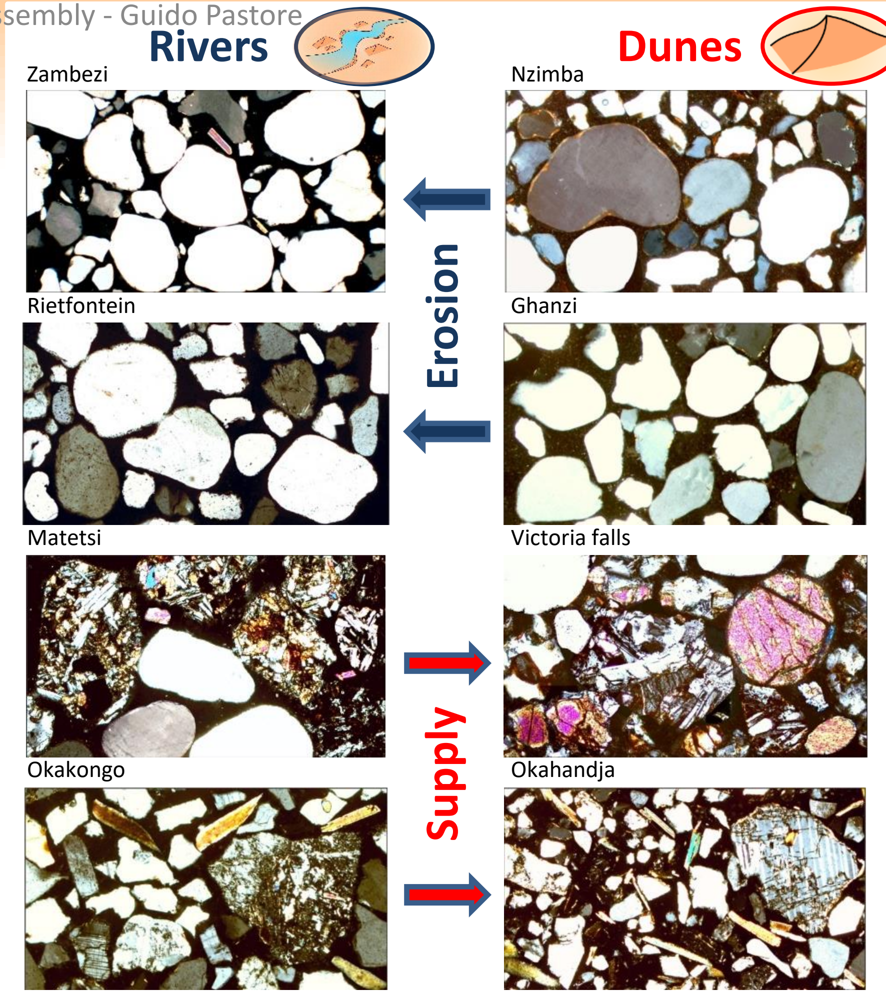








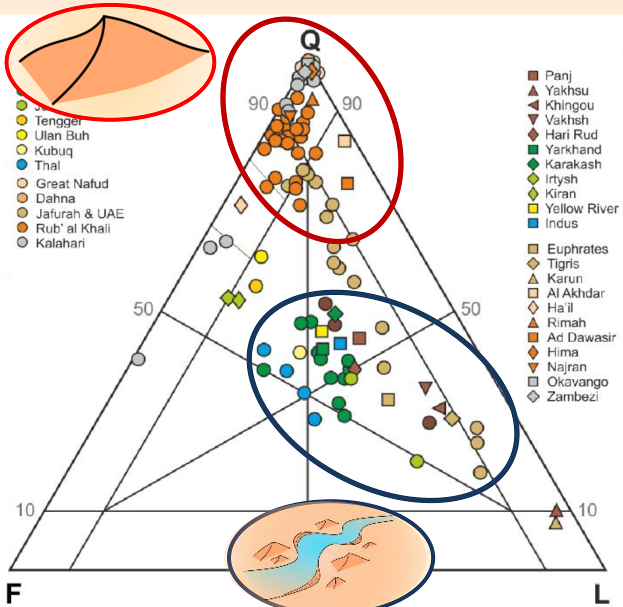


% of rounded quartz accounts for dunes contribution to river bed load:

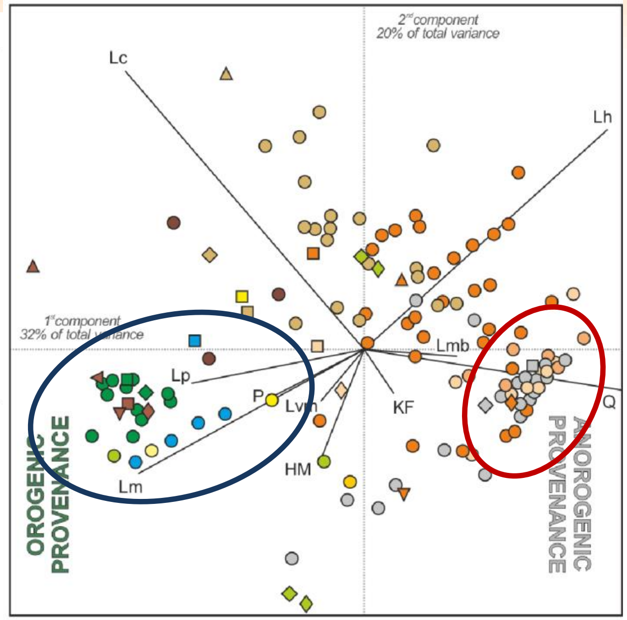
- Upper Zambezi up to 90%
- Western Zambezi tributaries 35-50%
- Upper Gwai 80%

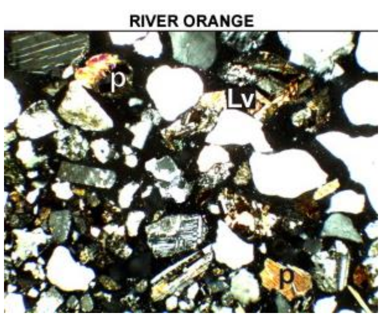
Garzanti et al., 2022

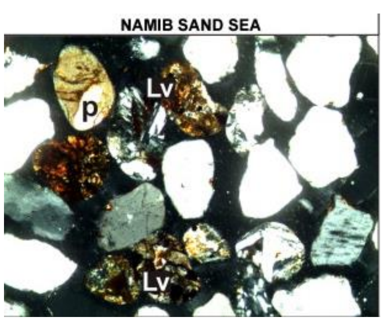
FLUVIAL-AEOLIAN INTERPLAY



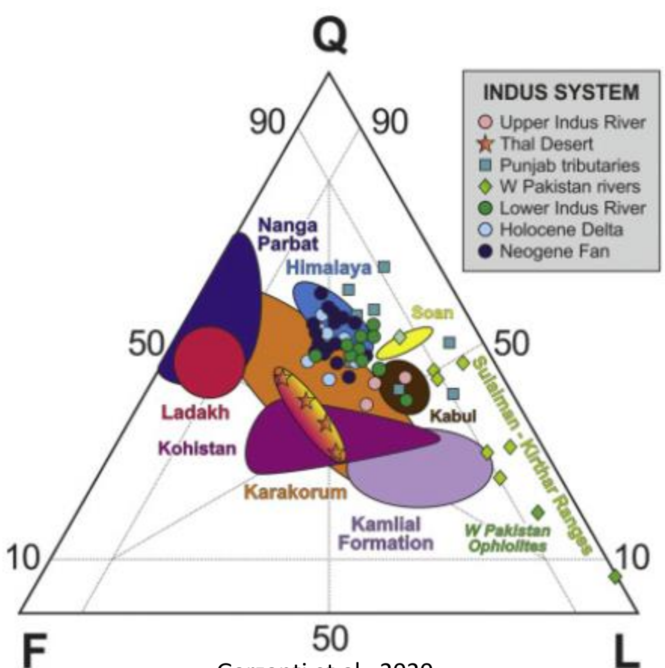
Garzanti et al., 2019



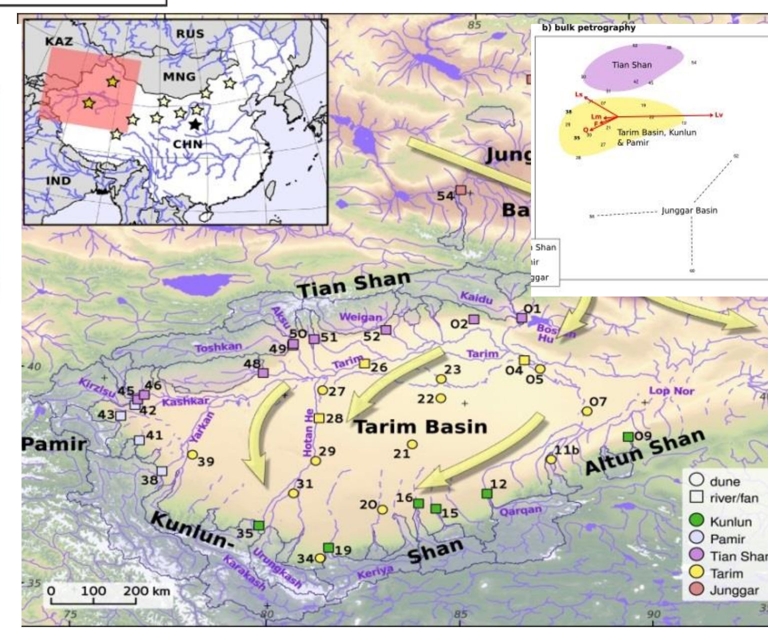




Garzanti et al., 2012



Garzanti et al., 2020



Rittner et al., 2016

CONCLUSIONS

Sahara **hyper-arid** environment is dominated by **aeolian dinamics**, which recycles older sandstones.

Kalahari dunes **echoes** the multiple stages of **weathering** occurred in the past.

Fluvial network can interrupt the "**recycling factory"** of the desert, introducing first cycle eroded sediment **deflated** from **river** bars into the **dunes**.

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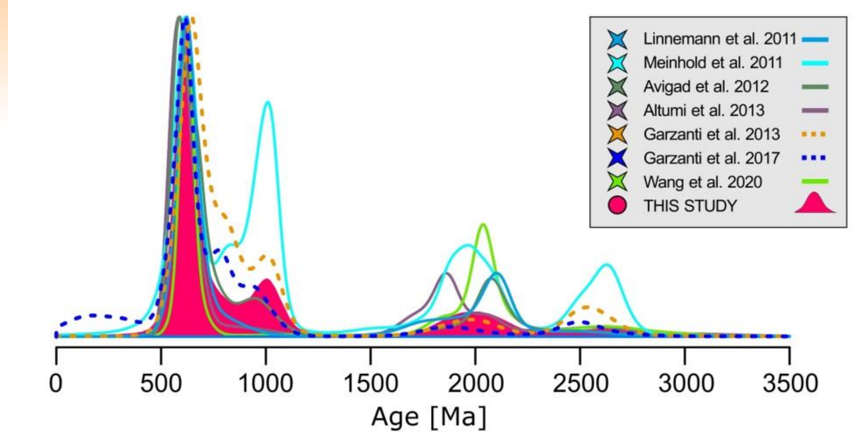

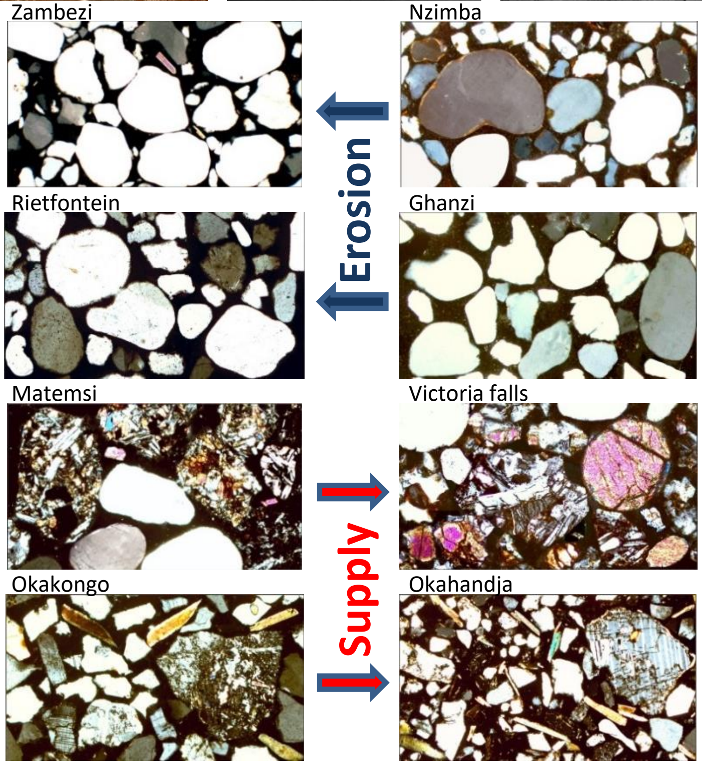

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SAHARA

KALAHARI

PROVENANCE

Laboratory for Sediment Provenance Studies

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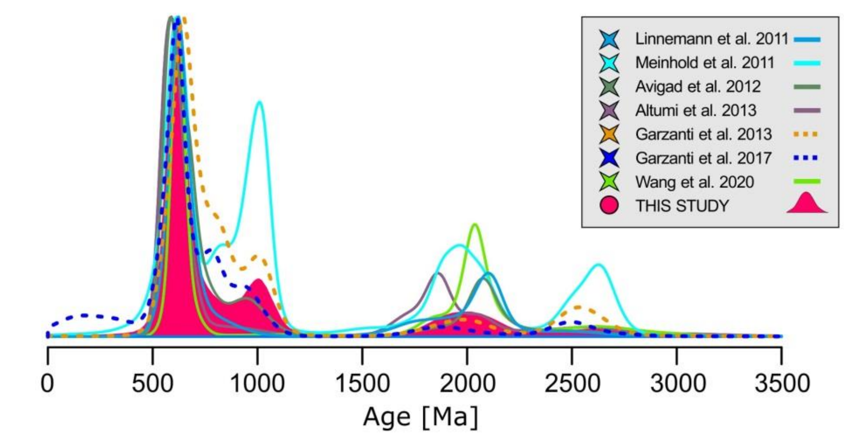

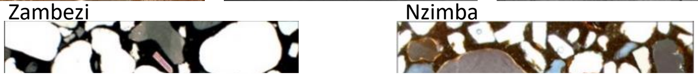

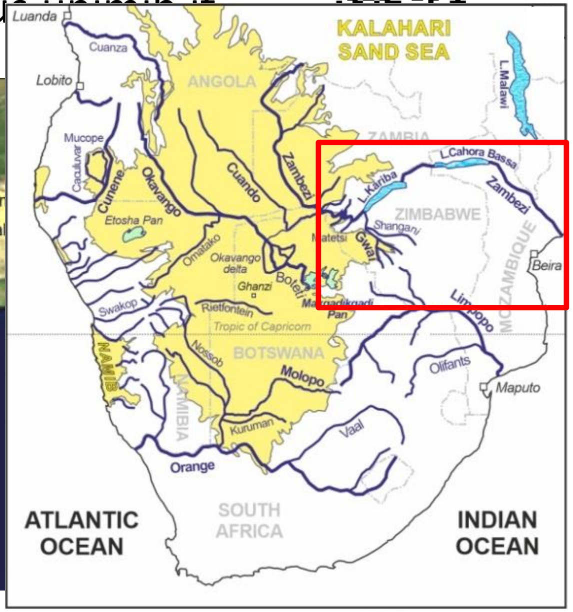

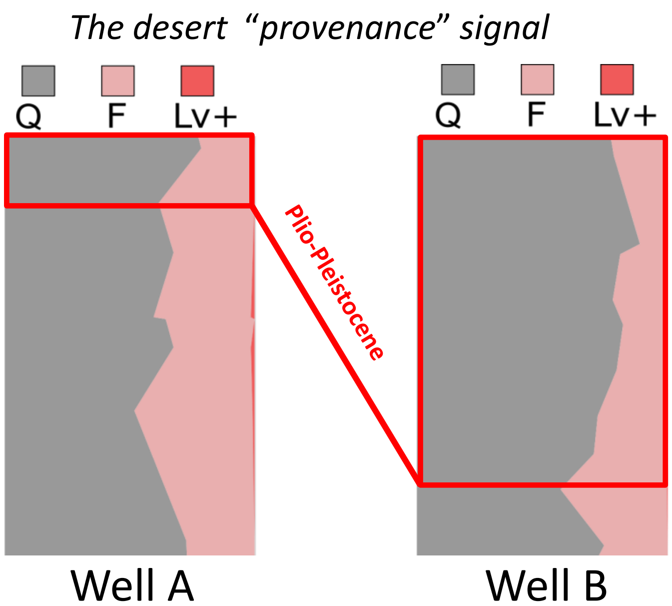

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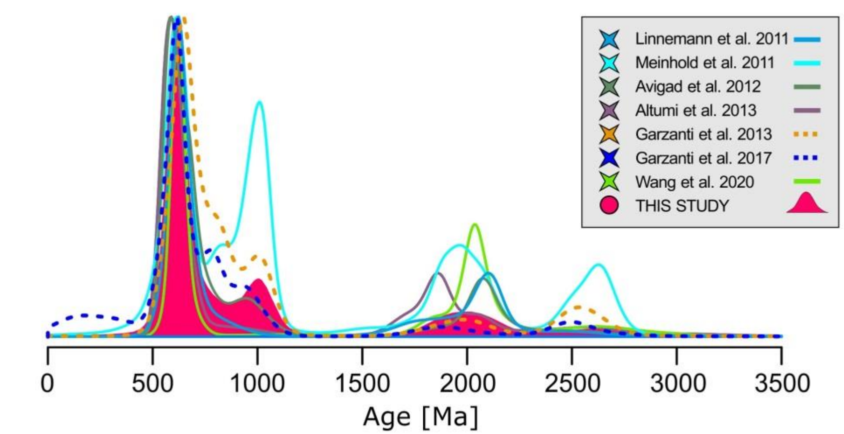

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