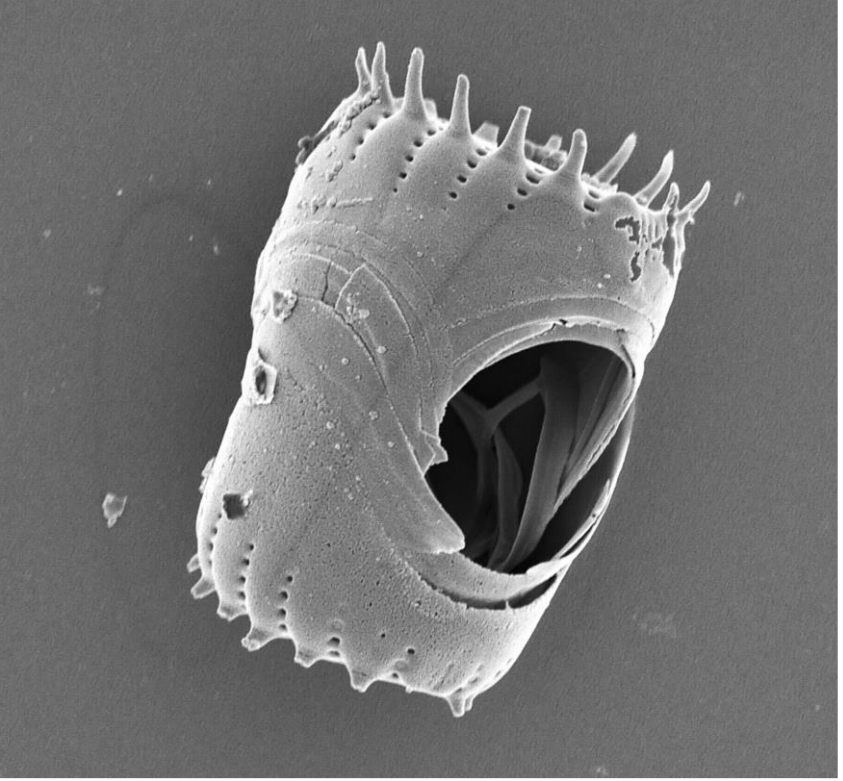

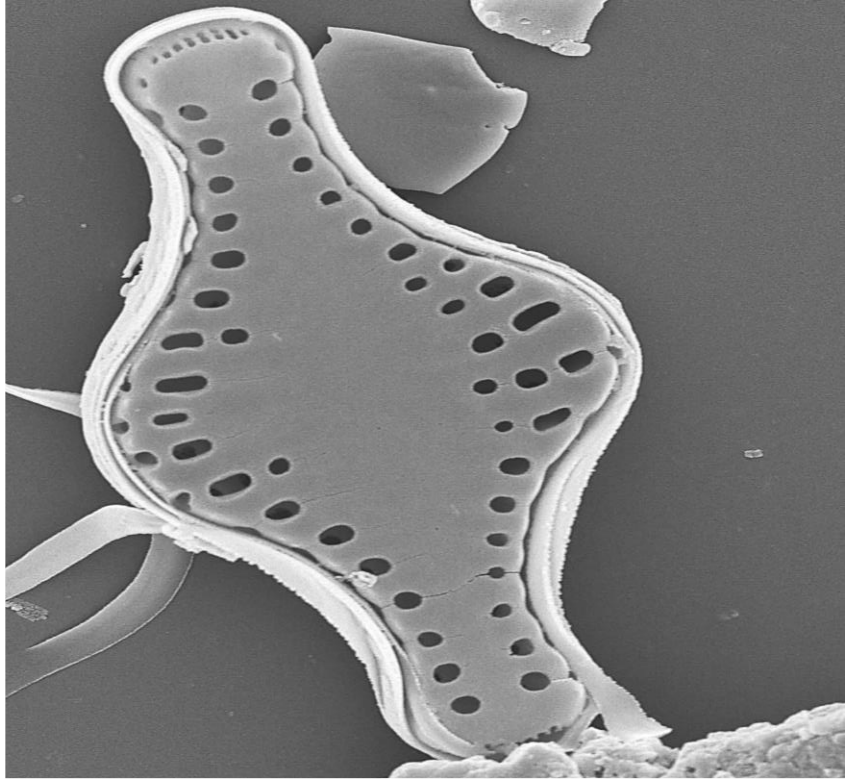

Environmental change in the Afro-alpine zone: a 16,000-year diatom record from Garba Guracha, Bale Mtns., Ethiopia.

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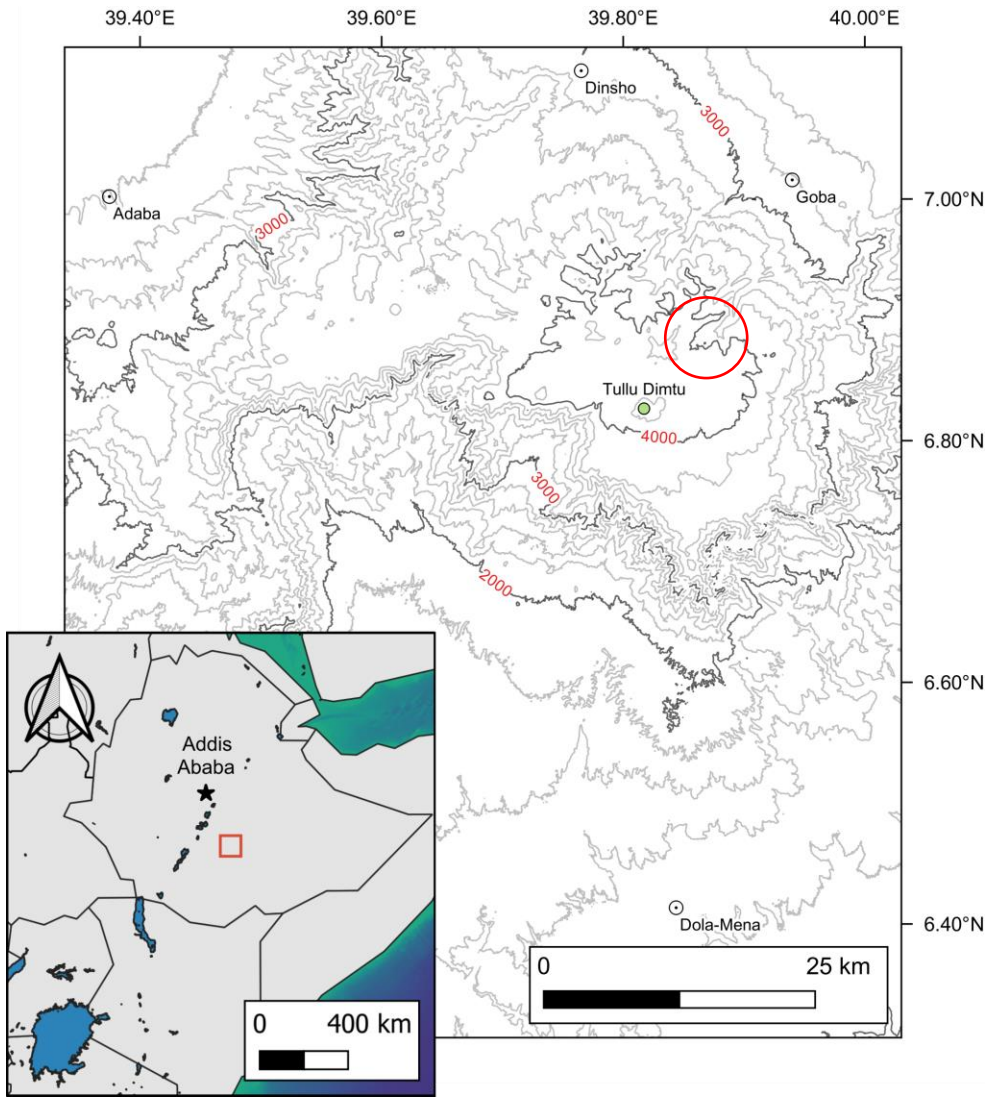
INQUA 2019
Dublin, Ireland 25th–31st July 2019

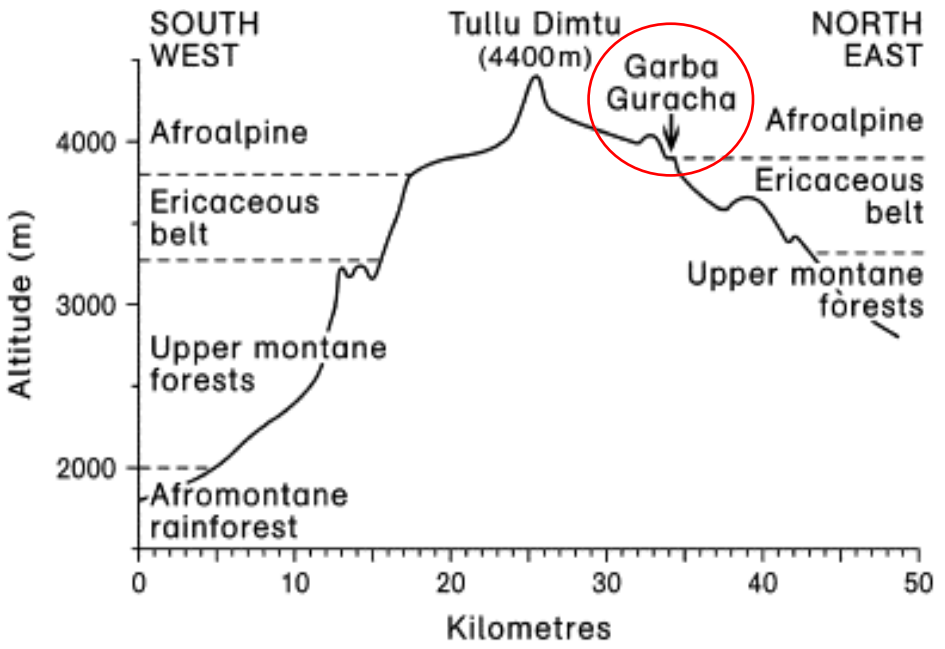
Study site: Garba Guracha, Bale Mtns., Ethiopia



The Bale Mtns. form the largest continuous area above 3000 m in Africa

Garba Guracha: A small (500 x 300 m) **cirque lake** between the Ericaceous belt and the Afroalpine zone

NE-SW transect



Umer *et al*. (2007)

Previous studies at Garba Guracha

Fossil Pollen

Quaternary Science Reviews 26 (2007) 2229–2246

Late Pleistocene and Holocene vegetation history of the Bale Mountains, Ethiopia

M. Umer[a], H.F. Lamb[b,*], R. Bonnefille[c], A.-M. Lézine[d], J.-J. Tiercelin[e], E. Gibert[f], J.-P. Cazet[d], J. Watrin[d]

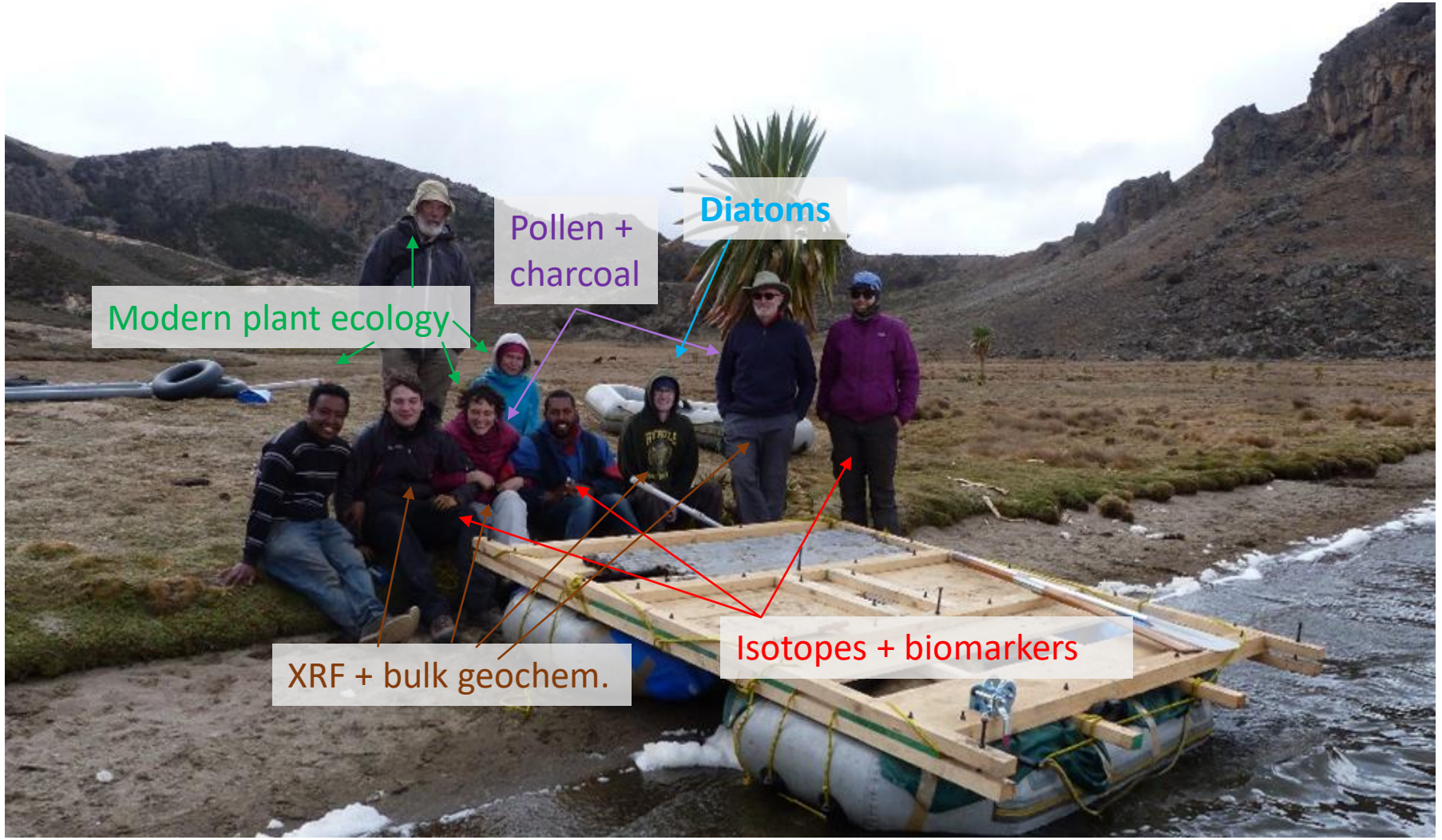
Core sedimentology & geochemistry

Quaternary Science Reviews 27 (2008) 449–467

High-resolution sedimentary record of the last deglaciation from a high-altitude lake in Ethiopia

J.-J. Tiercelin[a,*], E. Gibert[b], M. Umer[c], R. Bonnefille[d], J.-R. Disnar[e], A.-M. Lézine[f], D. Hureau-Mazaudier[g], Y. Travi[h], D. Keravis[e], H.F. Lamb[i]

Adding to the Garba Guracha story



Key questions to add to the story

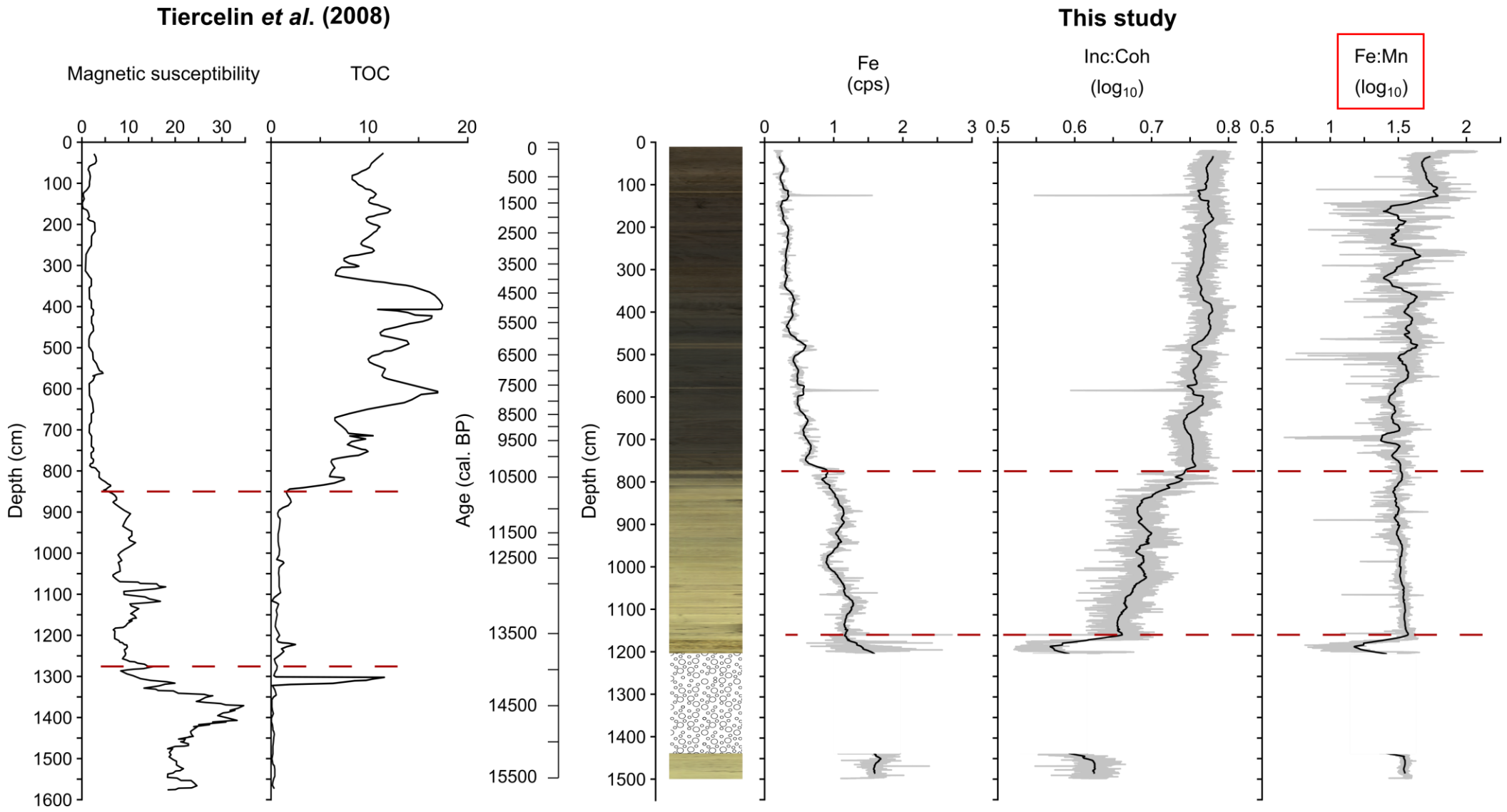
- What changes can we pick out in the diatom record?
- What role does environmental change play in driving changes in the diatom community at Garba Guracha?
- How do the changes at a high altitude site like Garba Guracha compare to changes inferred at lower altitudes in eastern Africa?

The cores: GGU17-BAL-1A & 1B

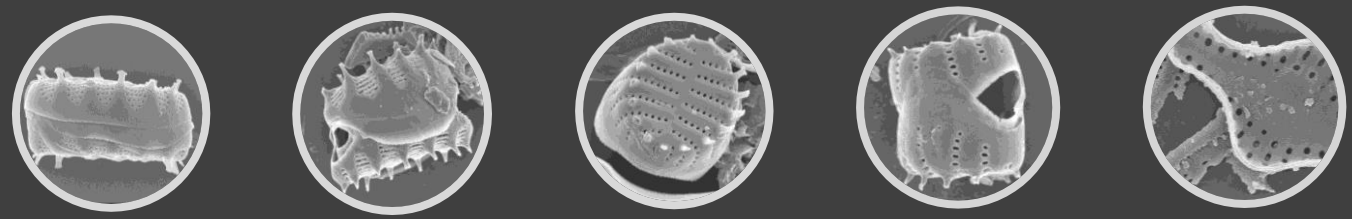
- Composite created from two 15 m Livingstone cores from the centre of the lake
- 24 radiocarbon dates in total from (i) compound class n-alkane (ii) micro-charcoal fragments and (iii) bulk organic samples
- Cs-Pb dating of the uppermost 50 cm of sediments at a 1 cm resolution

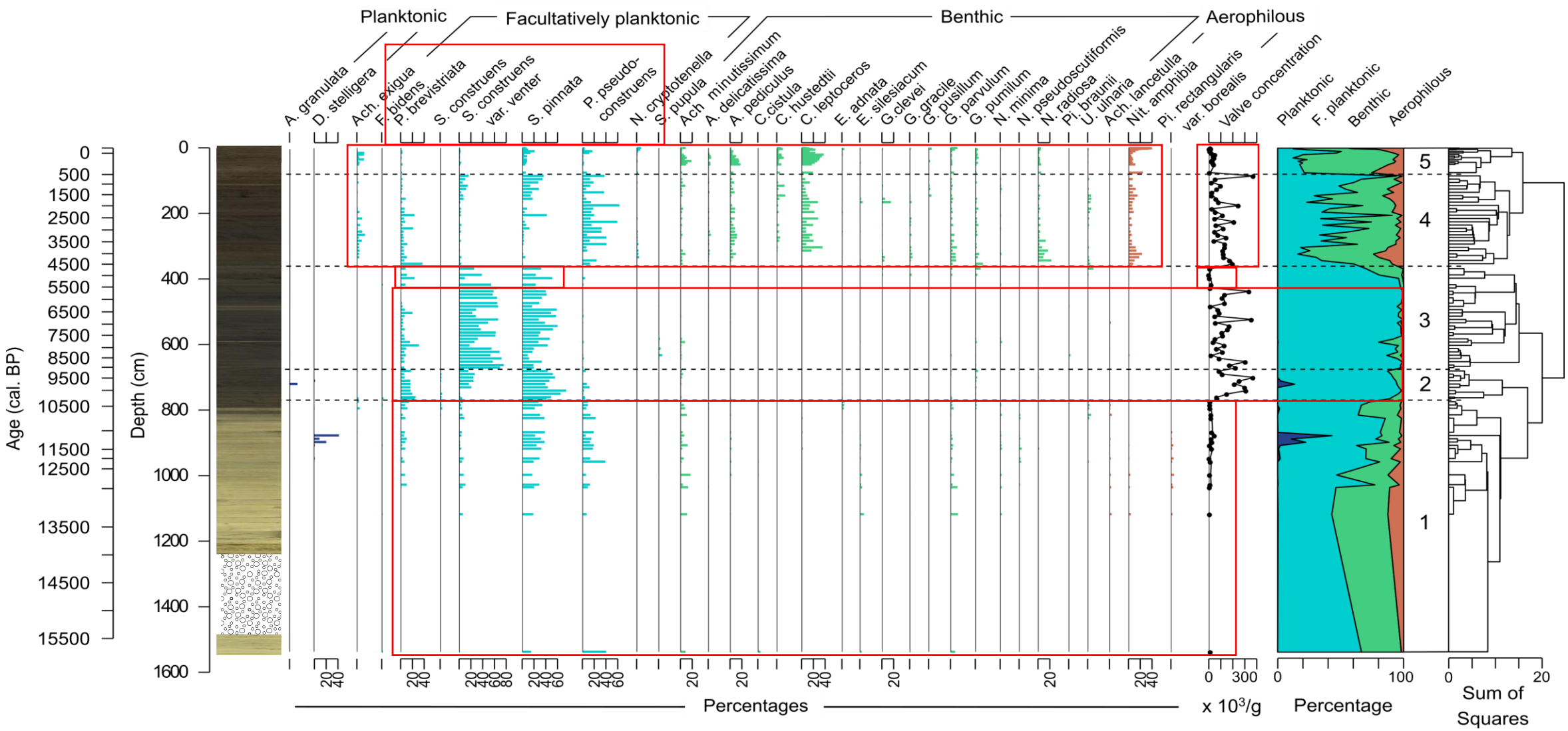
Unsplittable gravels!

Sediment XRF-derived geochemistry



16,000 years of diatoms

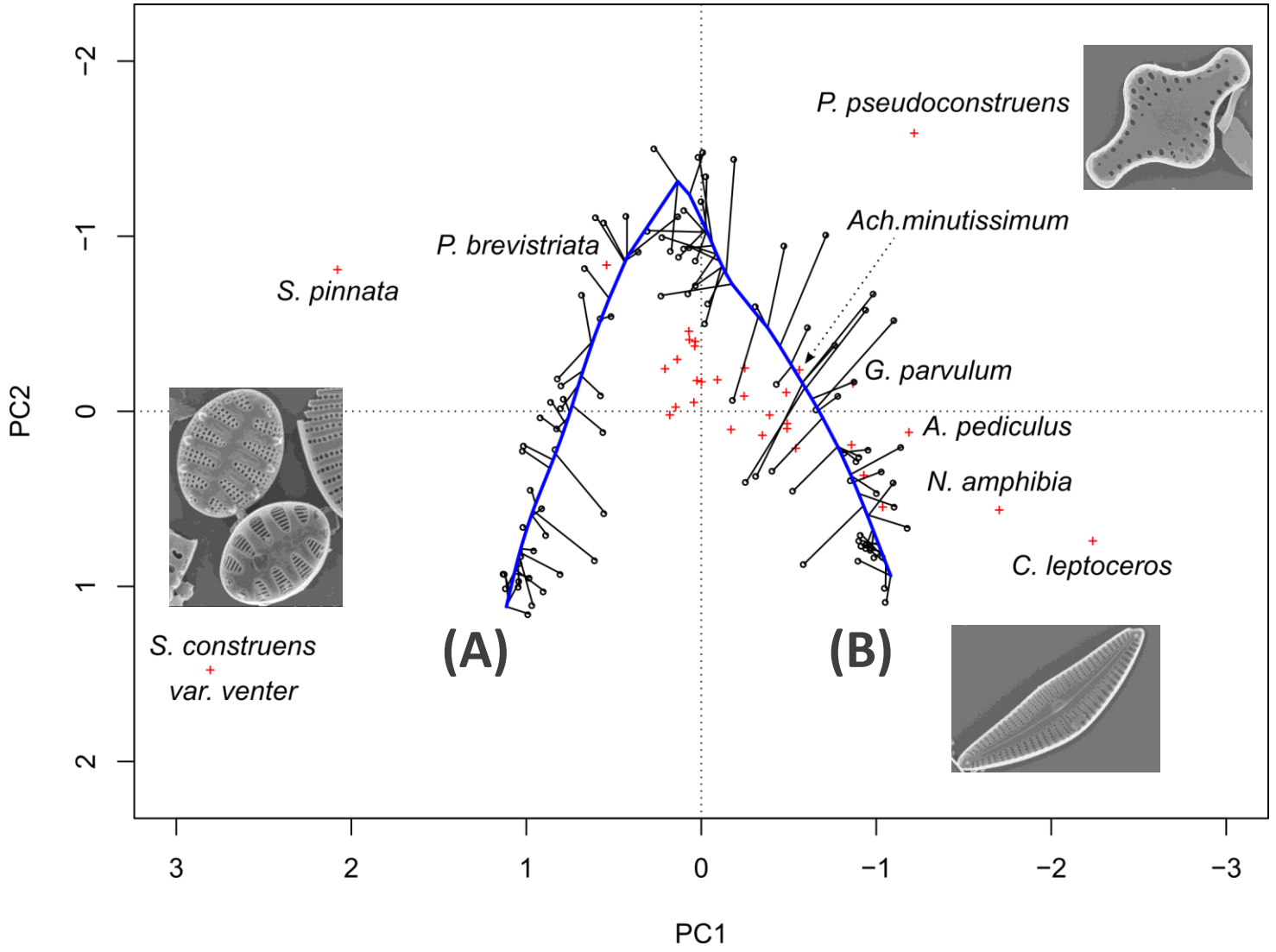




Diatom changes ordinated

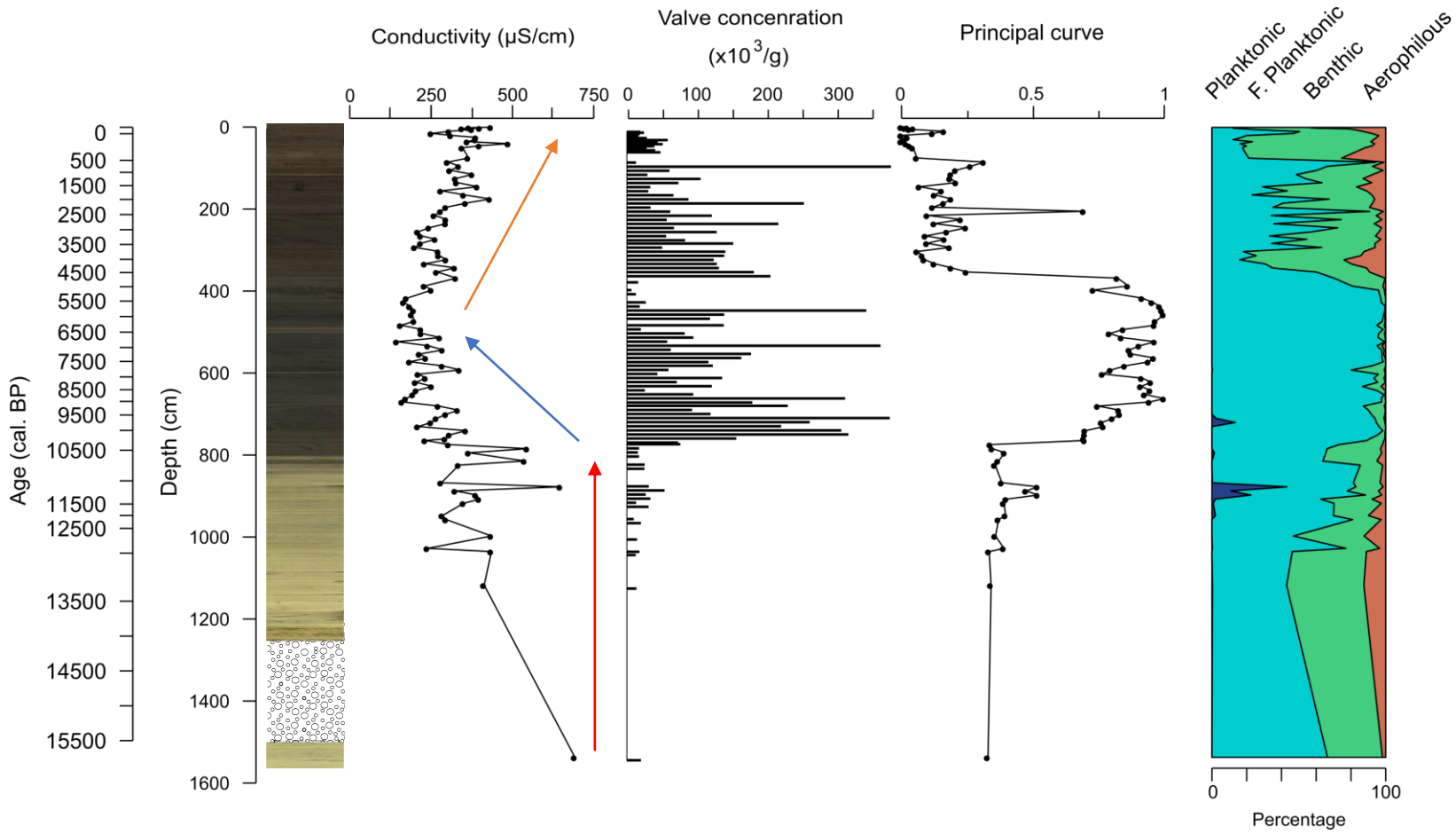
A principal curve (Simpson & Birks, 2012) fitted through the data explains ~67% of variance

Splits the distributions of taxa through the record showing the progression from a small Fragilarioid dominated assemblage (**A**) to a more diverse, periphytic community (**B**)



Subtle ecological change at Garba Guracha

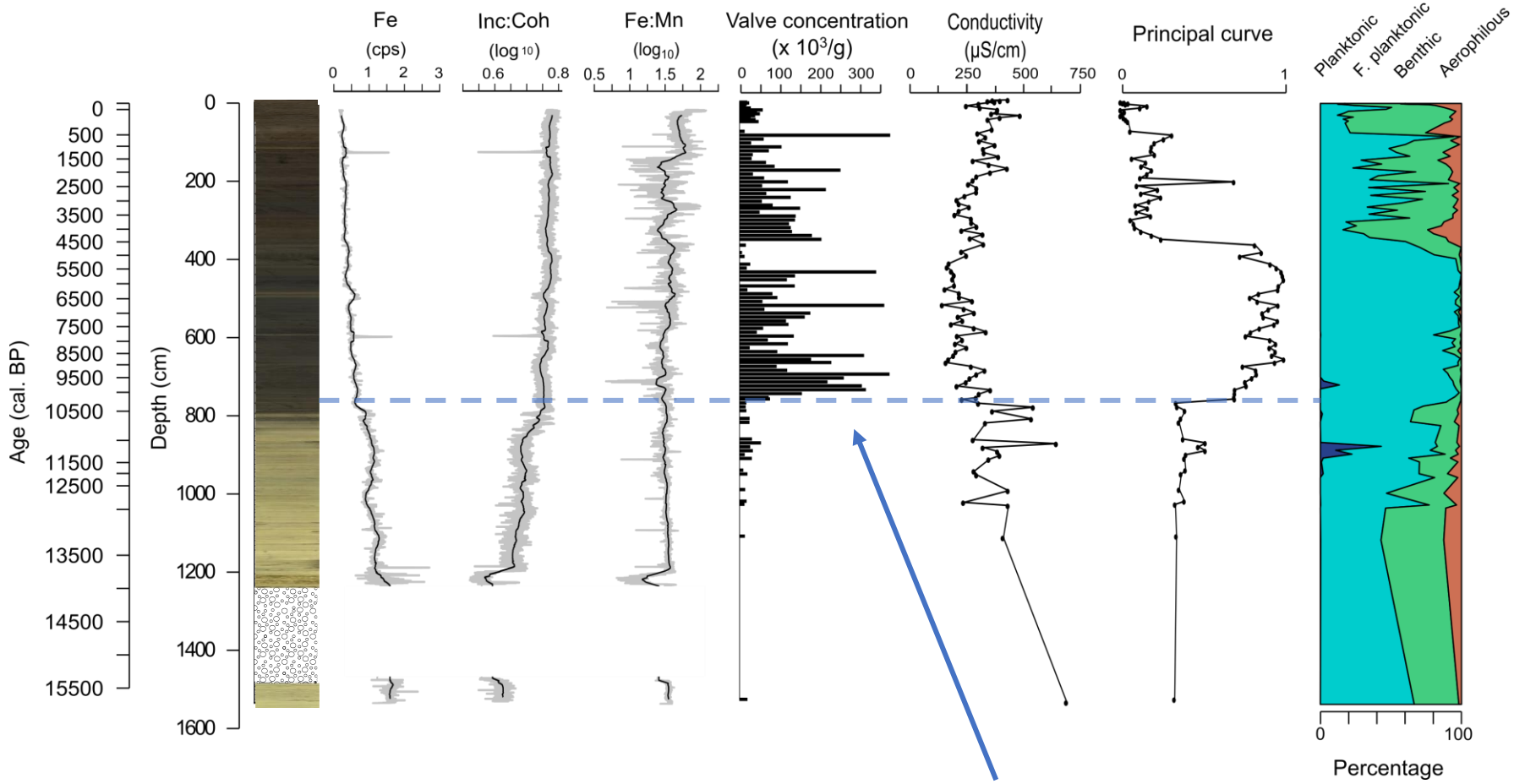
- Diatom record of widely tolerant, largely oligotrophic species – at first seems difficult to interpret
- e.g.: if just plotting diatom–inferred conductivity the record shows fresher to… fresh waters at 5,500 cal. BP
- Nevertheless changes are evident in this sensitive system



Environmental changes at Garba Guracha

- Late Pleistocene/Early Holocene: High erosion in a **glacial** environment with **sparse vegetation cover**

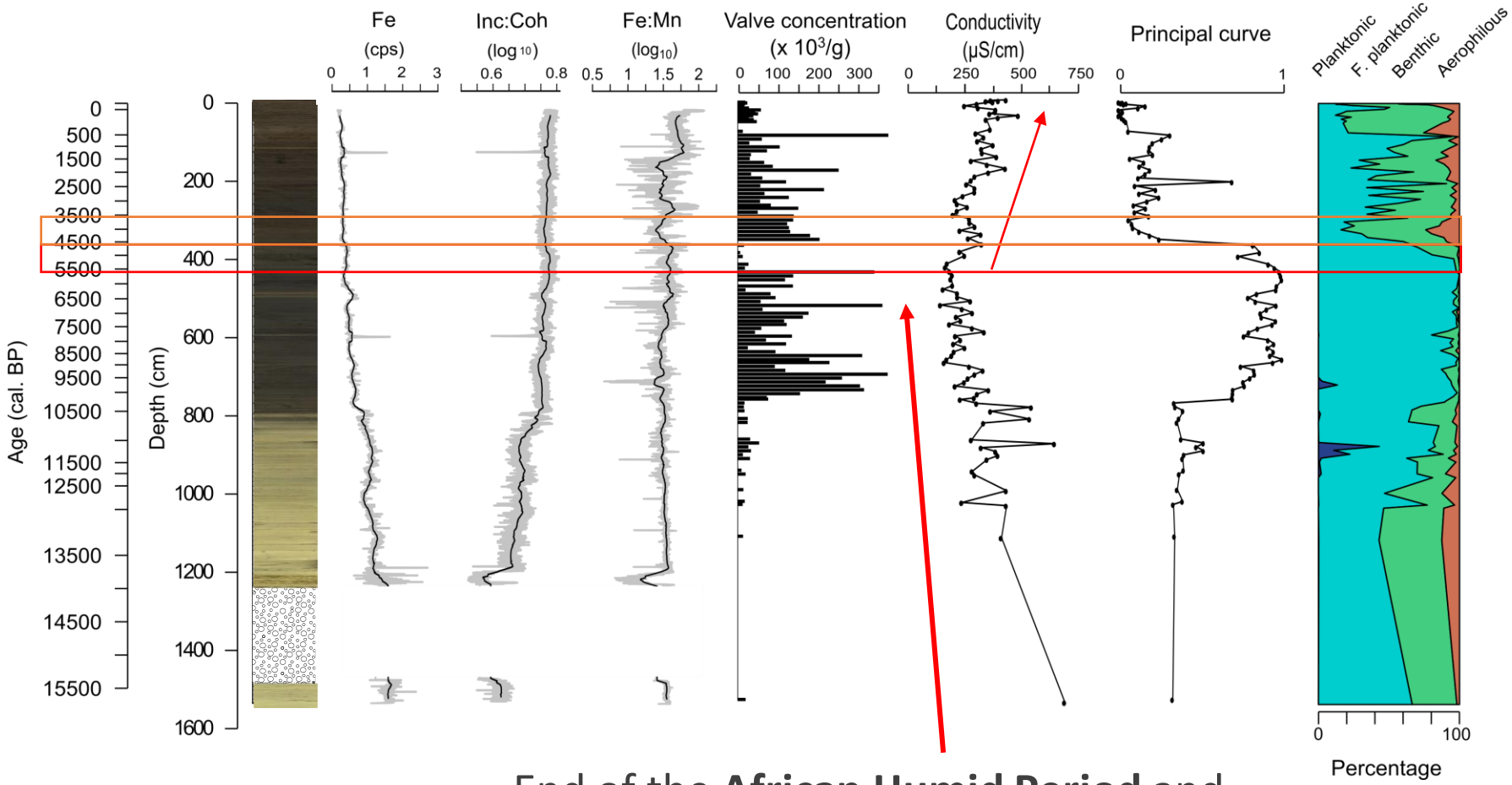
- Difficult to detect considerable **Younger Dryas** aridity like at other sites in the region – **site specific** characteristics masking this change?



Change in productivity and conductivity as catchment stabilises and transitions from a glacial environment?

Environmental changes at Garba Guracha

- Interval of low productivity at 5,500 BP and more lake mixing at 4,500 BP. Expansion of Podocarpus-Juniperus forest (Umer *et al.*, 2007): **drier conditions**?
- Transition from **poor Fragilarioid productivity** to **expansion** of suitable, **littoral habitat** by 4,500 BP instigating high productivity among the periphytic and aerophilous community



End of the **African Humid Period** and start of the **Meghalayan/4.2 kyr event**?

Take away messages:

- Broadly, the Garba Guracha catchment likely experienced similar shifts in climate in the last 16,000 years to those identified at lower altitudes across eastern Africa
- The sensitivity of certain proxies to these changes are important to consider
- Ecological change driven by habitat availability in response to a changing climate in this sensitive system
- Overall changes are subtle through the record until 5,500-4,500 BP with reorganisation of the diatom community