Magnetostratigraphy and Environmental Magnetism of the Aptian–Albian Boundary of a Sedimentary Core from the Sergipe-Alagoas Basin

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Abstract

The Early Cretaceous was dominated by greenhouse conditions coupled with increased ocean crust production rate, which led to critical climate, geographic and oceanographic changes and abrupt shifts in redox conditions in the oceans. Regarding Earth's magnetic field, the Aptian time interval recorded a high rate of polarity reversals. However, after 121.4 Ma, a long period of polarity stability, known as the Cretaceous Normal Polarity Superchron (CNPS), was established for ˜38 Myr. Although, there is debate on the causes and consequences of this extreme event, the exact behavior of the geomagnetic field during the Aptian–Albian is still poorly understood, and data from volcanic and sedimentary rocks are usually conflicting. Here we integrate paleomagnetic and biostratigraphic data across the Aptian–Albian transition in the Sergipe-Alagoas Basin (Brazil). Studies suggesting the correlation between magnetostratigraphic and biostratigraphic data for this interval in the Brazilian sedimentary basins are rare, as well as for the South Atlantic marginal basins. Additionally correlations with the Tethyan realm are still unclear. Magnetic parameters, such as magnetic susceptibility, with a resolution of 25 cm, and anhysteretic remanent magnetization (ARM), with a resolution of 2.1 m, were collected over the ˜200 m-long succession of Core SER-03 in the Sergipe-Alagoas Basin. ARM acquisition curves were separated into discrete coercivity components and they were interpreted as related to detrital magnetite and/or eolian dust inputs. The entire section spans 6 Myr, including the Aptian–Albian boundary. Our interpretation of environmental magnetism parameter, therefore, allow us to trace shifts between wet and dry climate conditions. Therefore, these data will aid to develop an age model framework in order to assist this uncovered region and future comparisons with Tethyan sections (e.g., Vocontian Basin - France and Poggio Le Guaine - Italy).

MAGNETOSTRATIGRAPHY AND ENVIRONMENTAL MAGNETISM OF THE APTIAN–ALBIAN BOUNDARY OF A SEDIMENTARY CORE FROM THE SERGIPE-ALAGOAS BASIN, SOUTH ATLANTIC OCEAN

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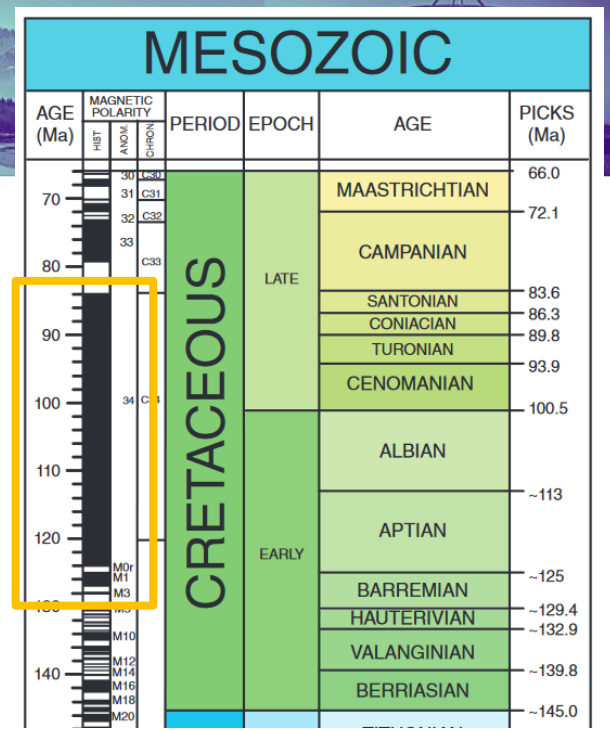
"CRETACEOUS LONG NORMAL-POLARITY CHRON" - SUPERCHRON C34N

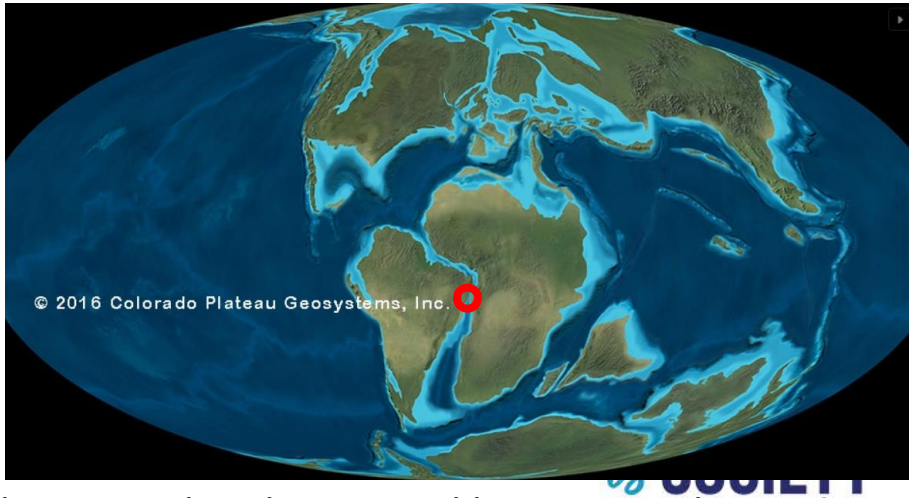
Changes in Geomagnetic Field, from high frequency reversions to a calm interval, an extended ~ 37-Myr of normal polarity chron.



Modified from ***Walker et al., 2018***.

DRASTIC ENVIRONMENTAL CHANGES

Changes in paleogeography (South Atlantic), paleobiology, ocean geochemistry, anoxia events, anomalies in carbon isotopic composition and metal concentration in marine sediments, continental and oceanic magmatism.

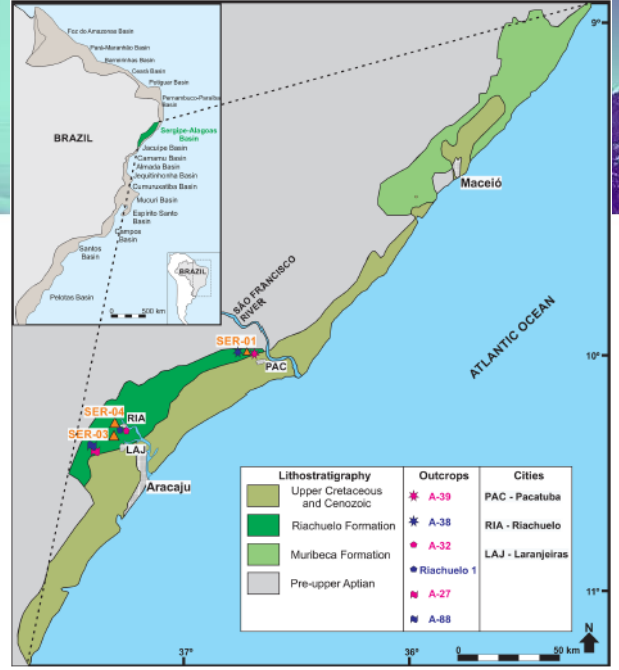


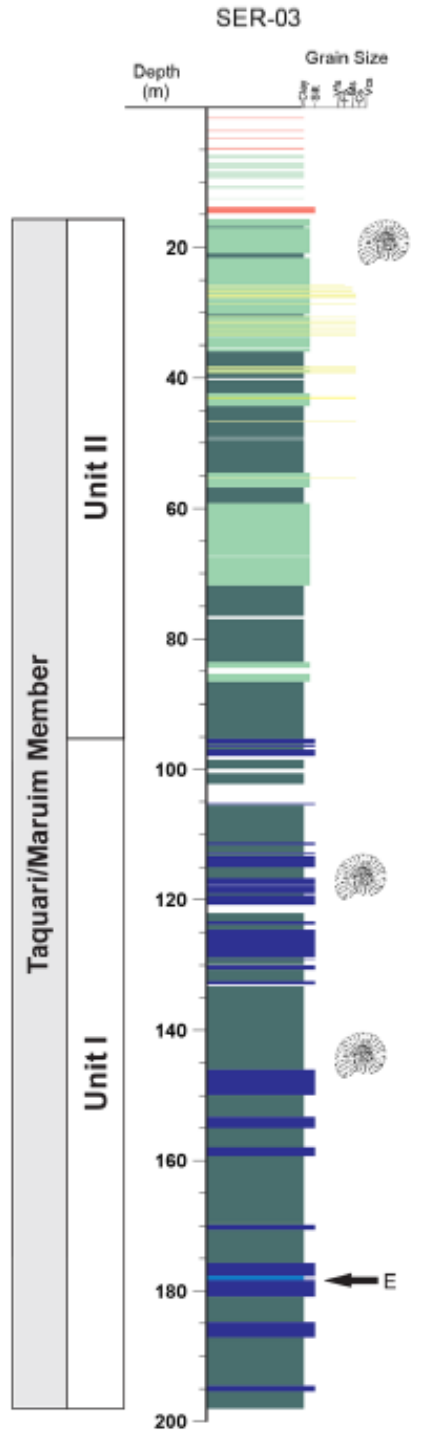
Sergipe-Alagoas Basin paleogeographic recosntruction ~110 Ma

Paleoenvironmental, paleosecular earth's magnetic field and paleointensity variations during the C34N.

SER-03 core of the Sergipe-Alagoas Basin.

Total: 200.1 m – Riachuelo Fm.





Composed mainly of fine-grained sediments, such as shales, marls and packstones, some ammonite shells and interspersed layers of dark gray shales. There are two intervals where the shales have a darker gray color (184.3-183.3 and 153.0-151.5m).

Maruim Mb. → carbonate shelf

Taquari Mb. → lagoons on the external shelf and on the slope

Fauth et al., 2021.

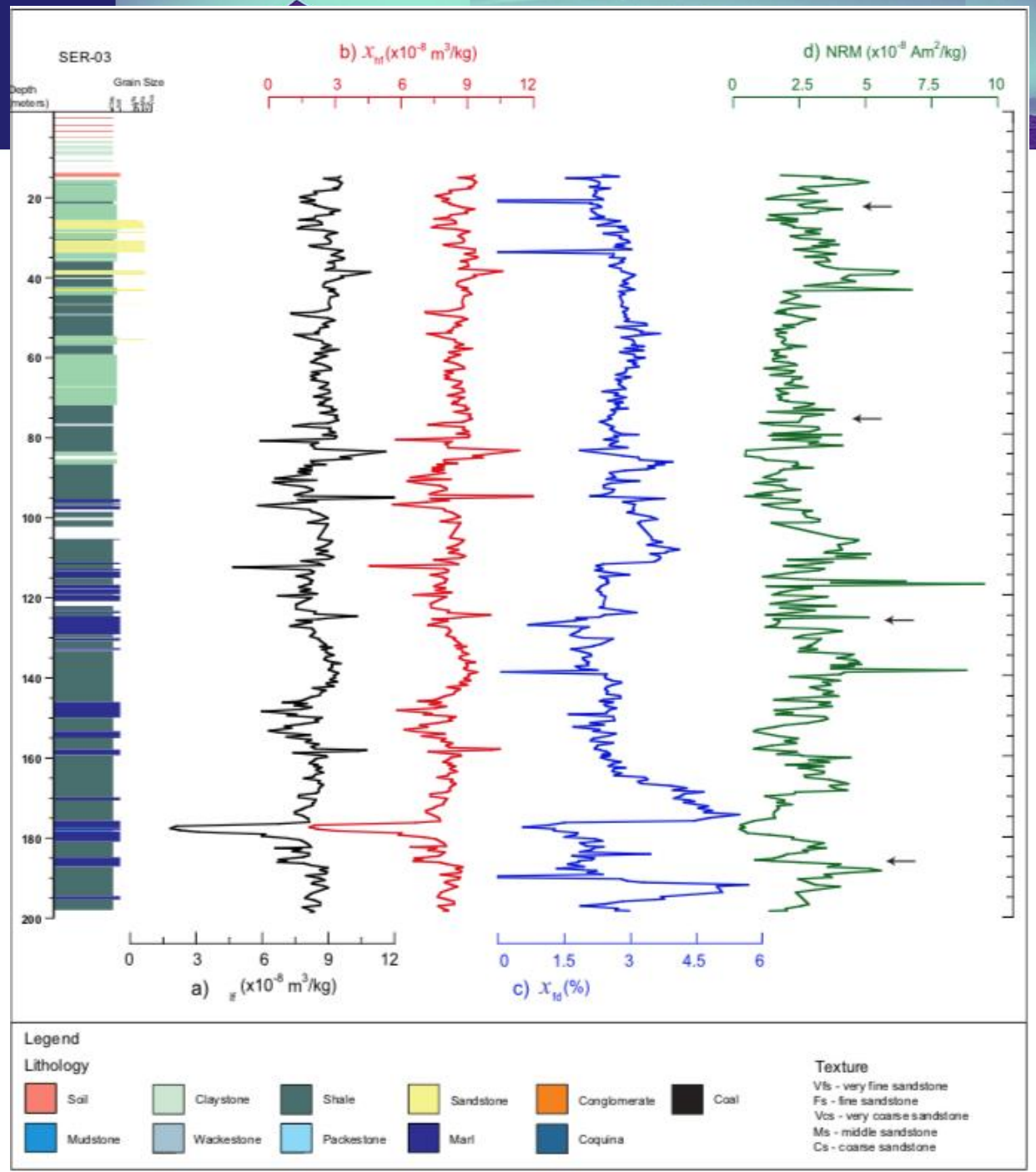
RESULTS

642 cubic samples

Magnetic susceptibility data

Lower values next to 180 m

Possible OAE (1b?) – Aptian/Albian - Maybe filling the gap of low-latitude records.



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Fauth et al., 2021.

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significance or broader impact

RESULTS

NRM 368 cubic samples

MAD average 5°

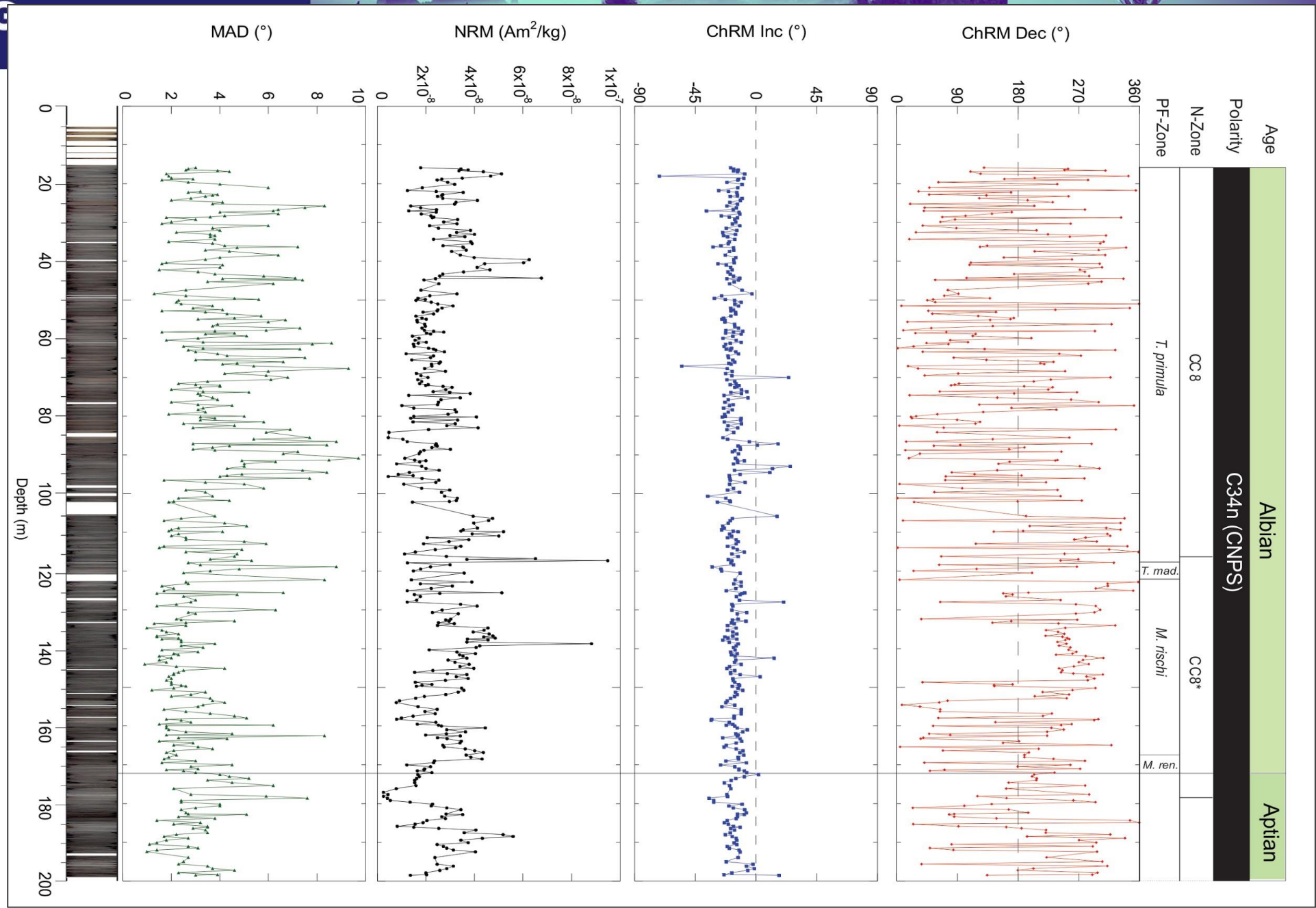
Normal Polarity C34n

planktonic foraminifera:

171.55m FO of *Microhedbergella renilaevis* → marks the base of the Albian

1st time that high resolution variation of the geomagnetic field is shown in this region

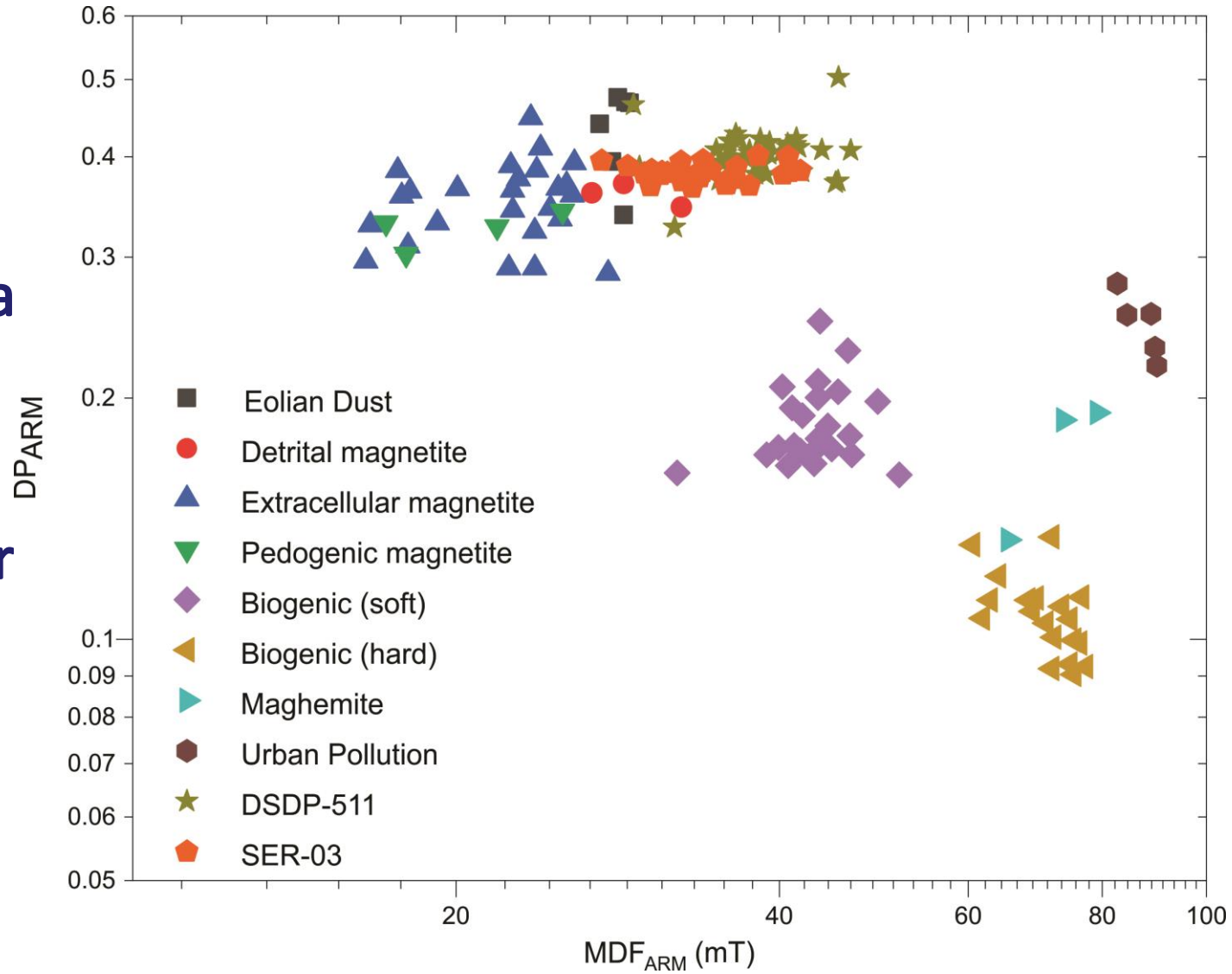
Fauth et al., in press.



RESULTS

Unmixing magnetic coercivity distributions - ARM acquisition data

the component is interpreted as related to detrital magnetite and/or eolian dust



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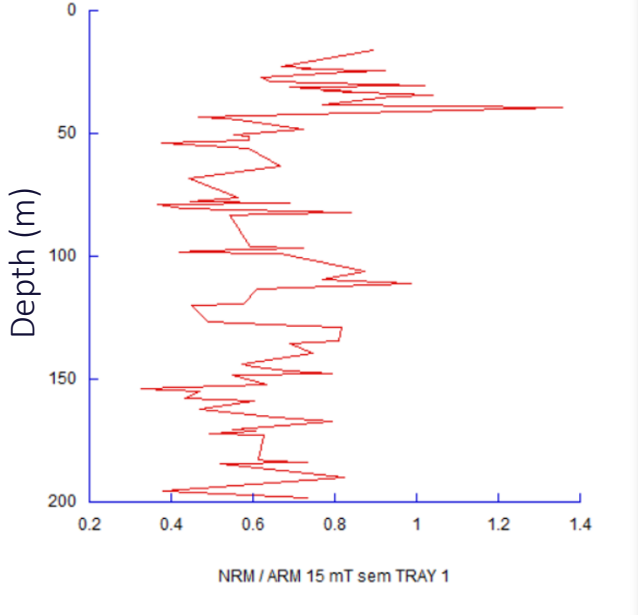
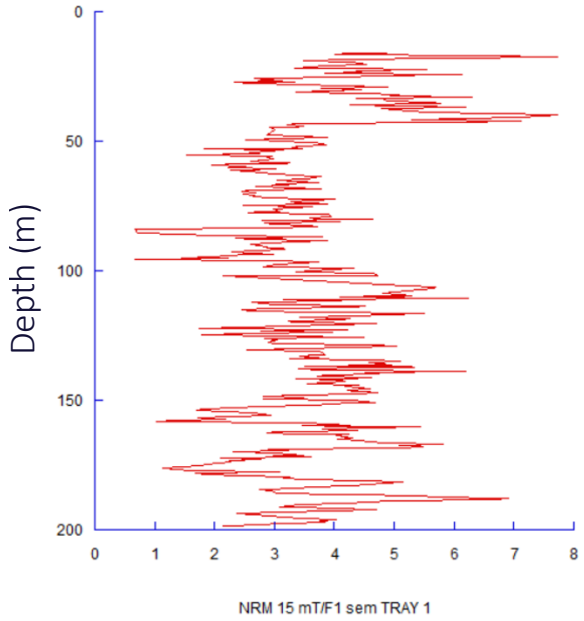
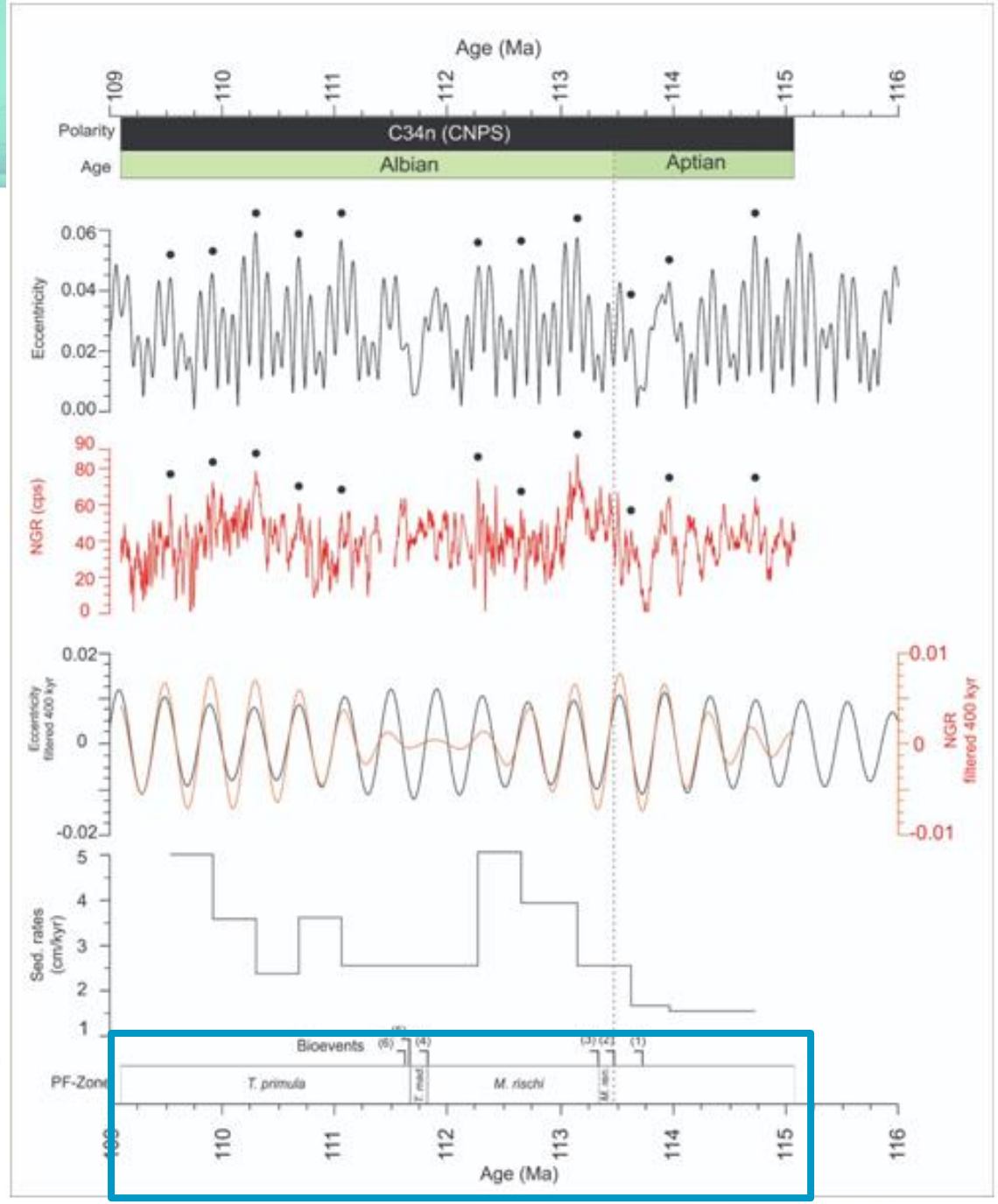




Relative paleointensity curve

High resolution age model



Fauth et al., in press.

THANK YOU

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