AGU FALL MEETING
New Orleans, LA & Online Everywhere
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Paleomagnetism of a Sediment Core from the Ontong-Java Plateau: for Better Understanding of the Role of Biogenic Magnetite in Geomagnetic Paleointensity Recording

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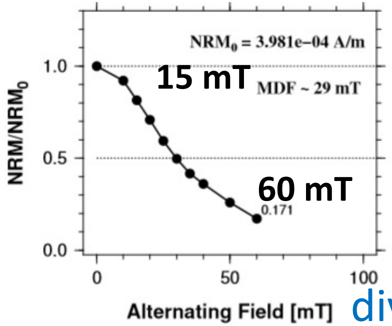
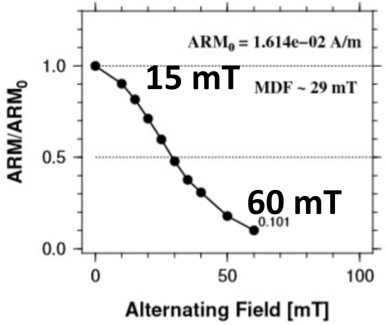
1. Introduction

The basic idea of relative paleointensity (RPI) estimation.



divide



NRM

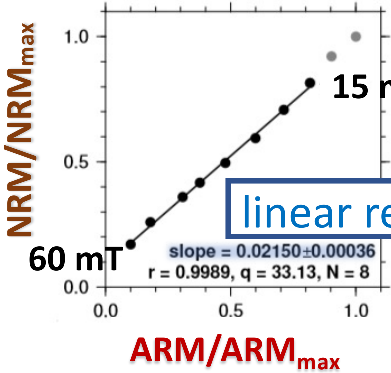
Original paleomagnetic record

normalization

"Magnetizability" of sediments

ARM or IRM

Demagnetization diagram

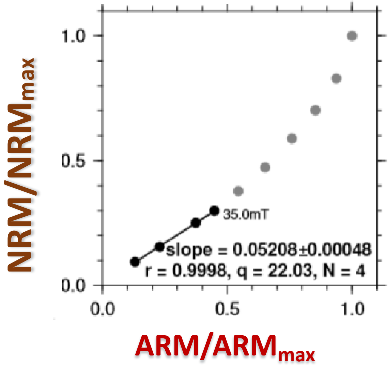


Similar coercivity distributions

linear regression

RPI

Different coercivity distributions

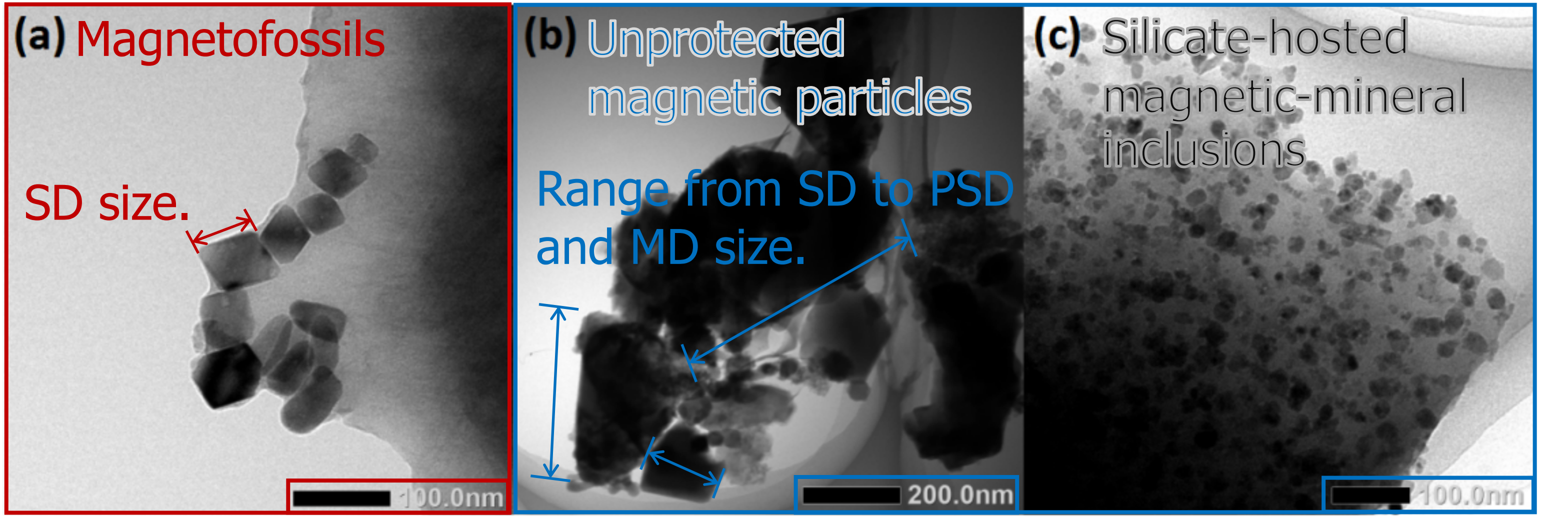


- Compositional complexity of magnetic mineral components in sediment may influence the reliability of RPI estimations.

1. Introduction

Biogenic and terrigenous magnetic components are considered as the two major components.

Biogenic **Terrigenous**



Better recorder of NRM?

Conventional NRM recorder.

Another candidate for preserving stable NRM?

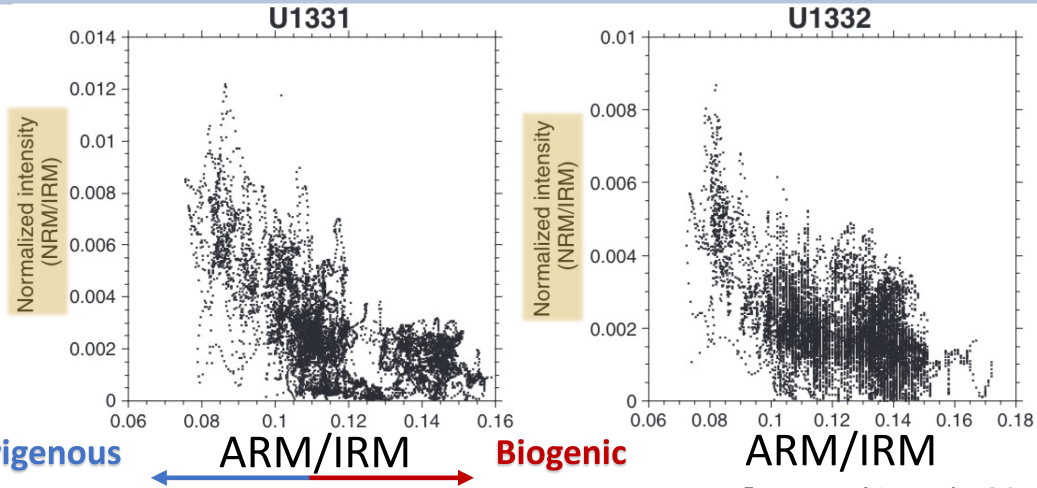
1. Introduction

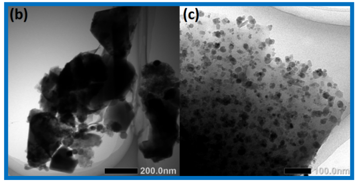
A correlation between ARM/IRM and RPI indicates a lithological contamination.

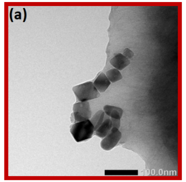
Reliability of RPI estimations

influence

"Lithological contamination" from compositional changes







[Yamazaki et al., 2013]

- It is attributable to differences in RPI recording efficiency between the biogenic and terrigenous components. *[Chen et al., 2017; Ouyang et al., 2014; Yamazaki et al., 2013]*

1. Introduction

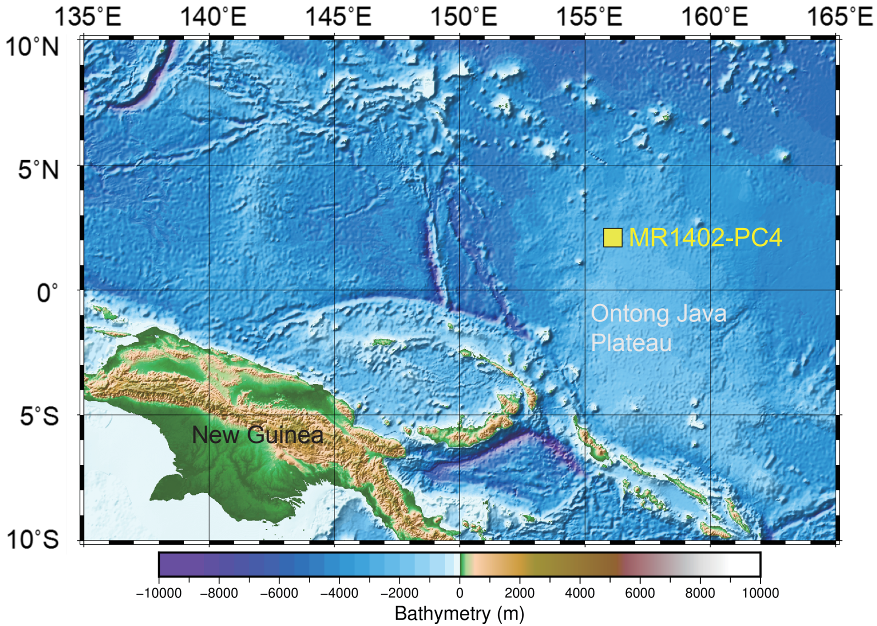
Purpose of this study.

- Try to distinguish and assess different contributions of biogenic and terrigenous magnetic components to RPI recording.
- Give a better understanding on how compositional variations in marine sediments can influence the reliability of RPI estimations.

2. Study materials

Core MR1402-PC4 was taken from the Ontong-Java Plateau in the western equatorial Pacific.

- The water depth (2447 m) is above the CCD.
- Light gray to light olive gray calcareous ooze.
- Mixture of magnetofossils and terrigenous magnetic minerals with carbonate.
- Age estimation was conducted based on $\delta^{18}O$ of benthic foraminifera.

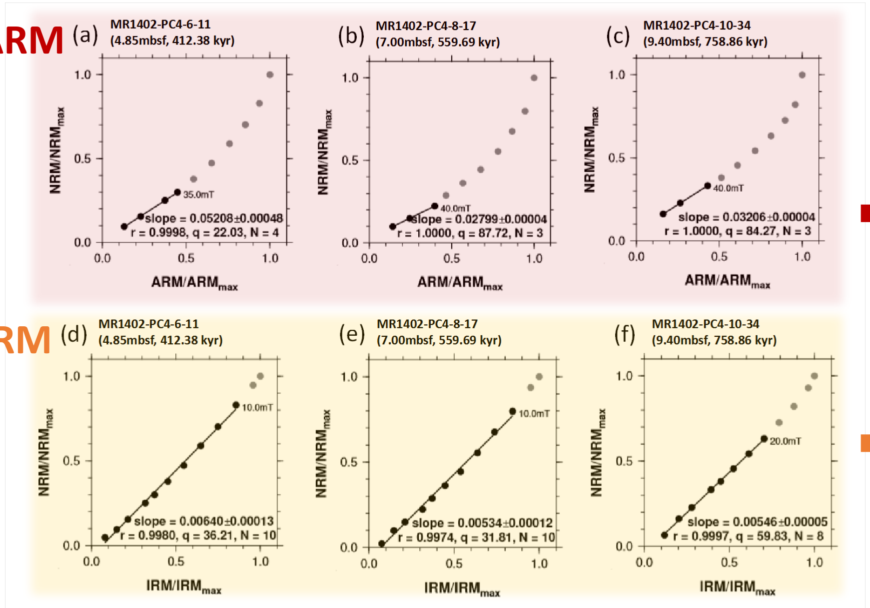


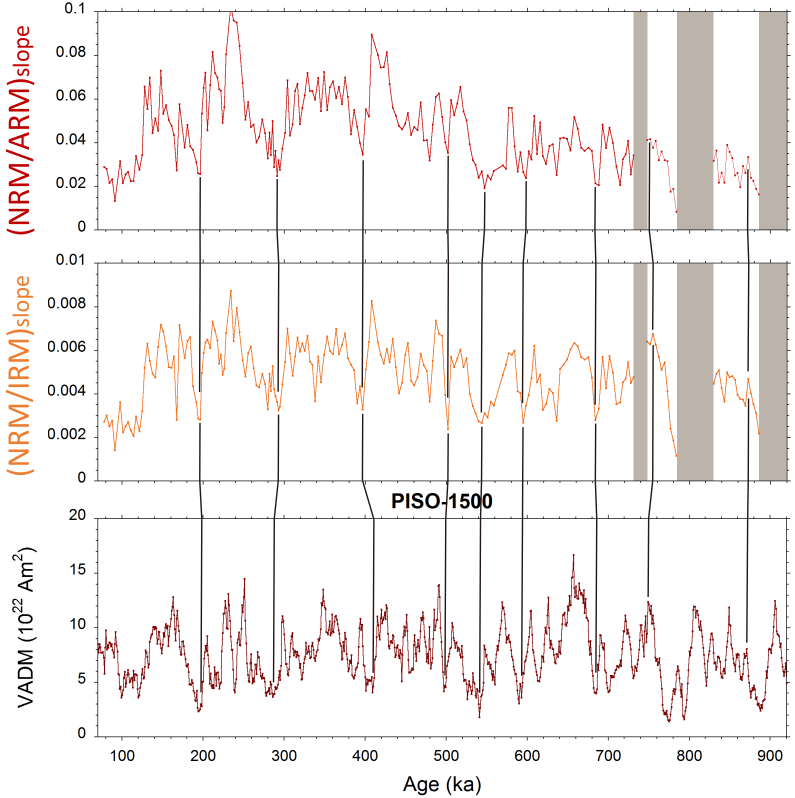
3. Results and interpretations

Different results in demagnetization diagrams and RPI estimations for NRM/ARM and NRM/IRM.

NRM/ARM

NRM/IRM

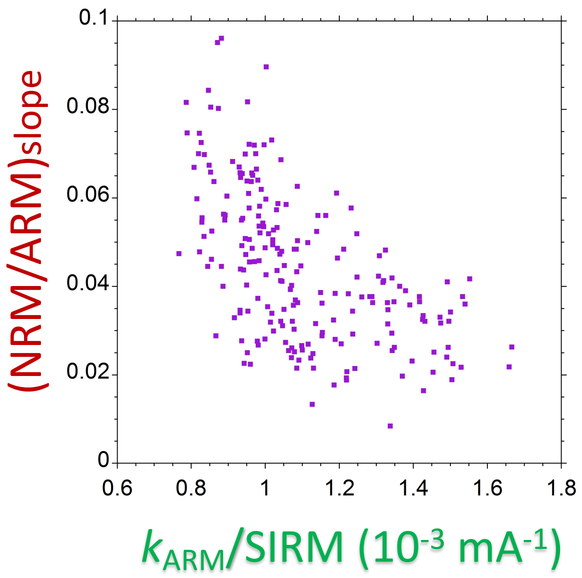


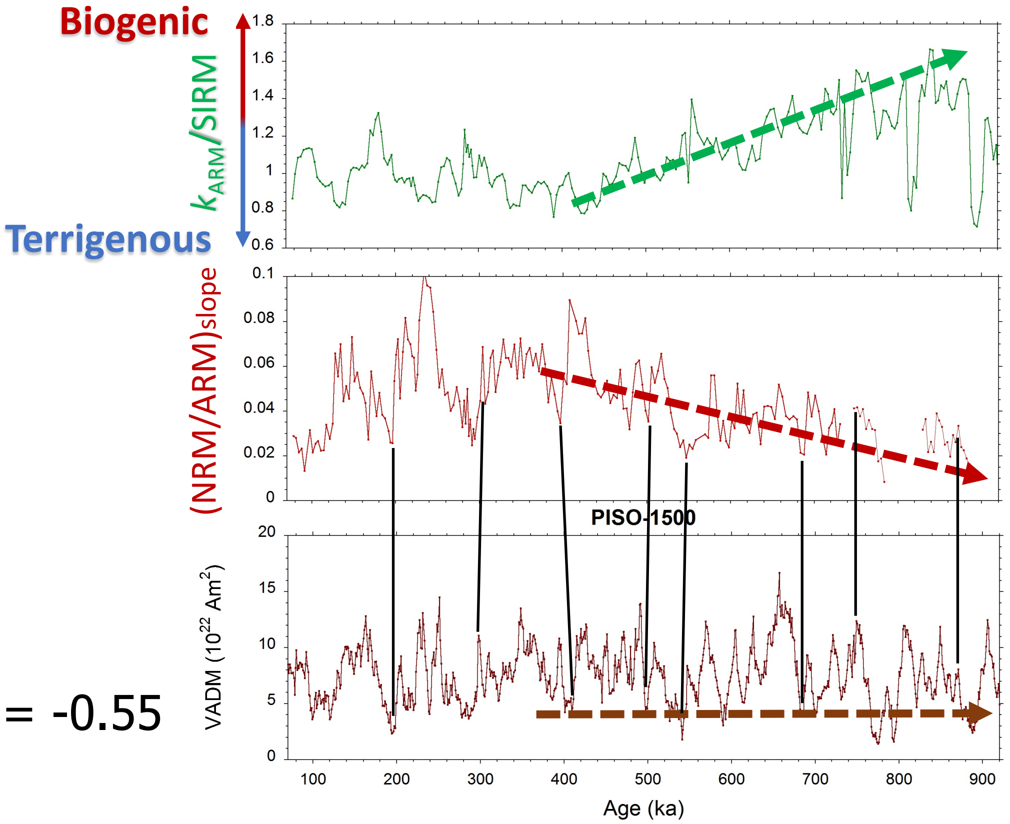


*Examples of RPI estimations obtained from best-fitting slopes on the NRM-ARM and NRM-IRM demagnetization diagrams.

3. Results and interpretations

k_{ARM}/SIRM has a rough inverse correlation with NRM/ARM.



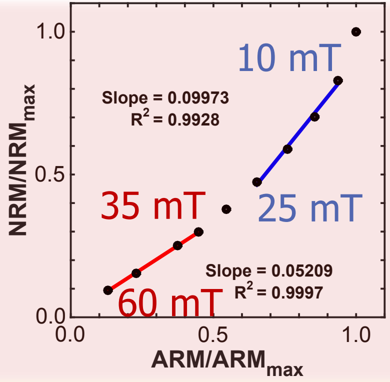


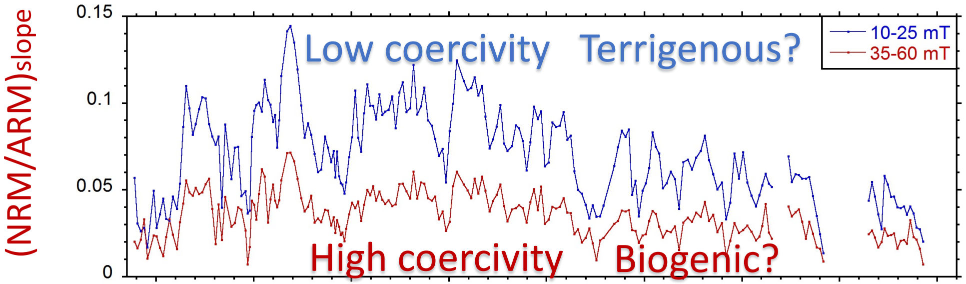
The approximate inverse correlation is indicated by a correlation coefficient ρ = -0.55 with P < 0.01.

3. Results and interpretations

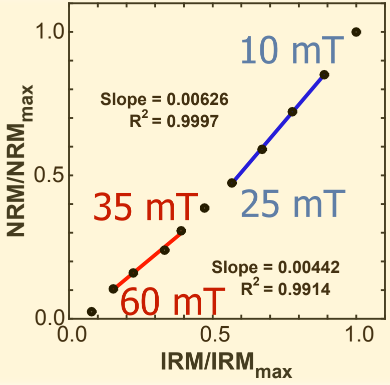
Best fitting slopes on demagnetization diagrams were recalculated for two AF demagnetization intervals.

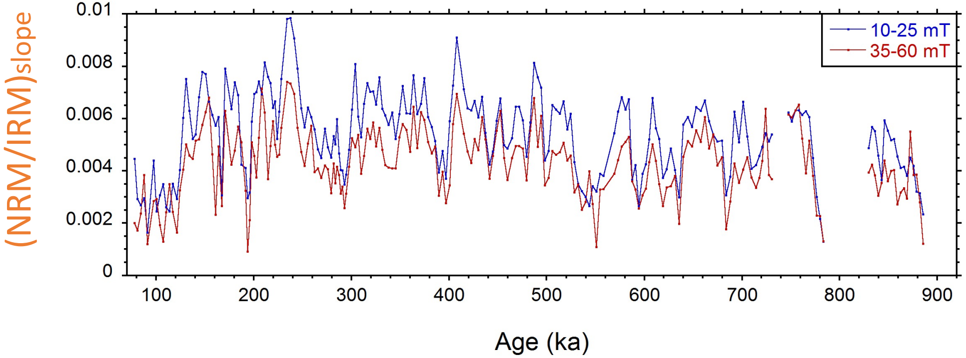
NRM/ARM





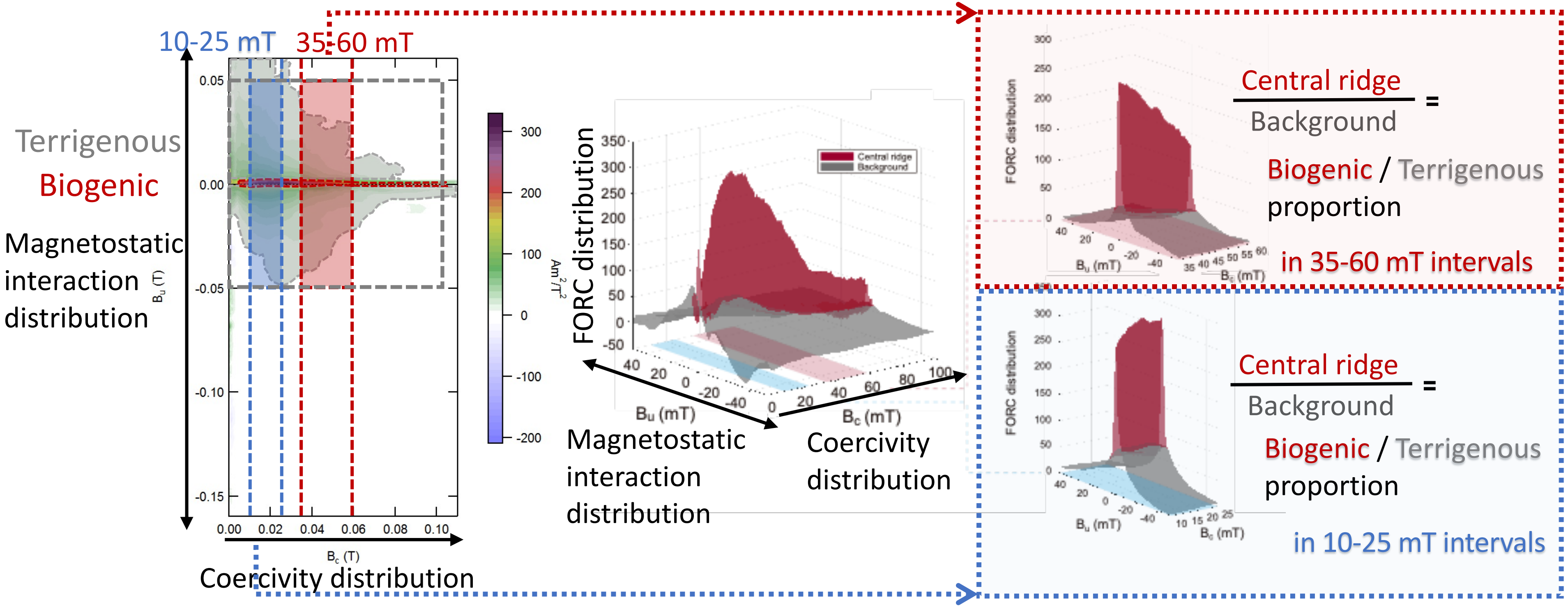
NRM/IRM





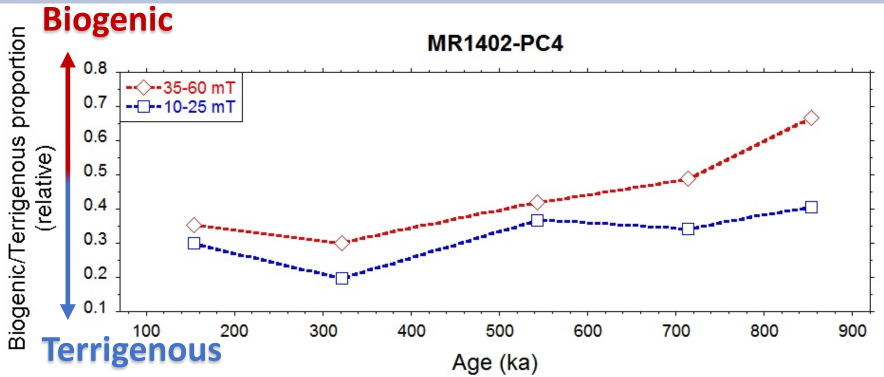
3. Results and interpretations

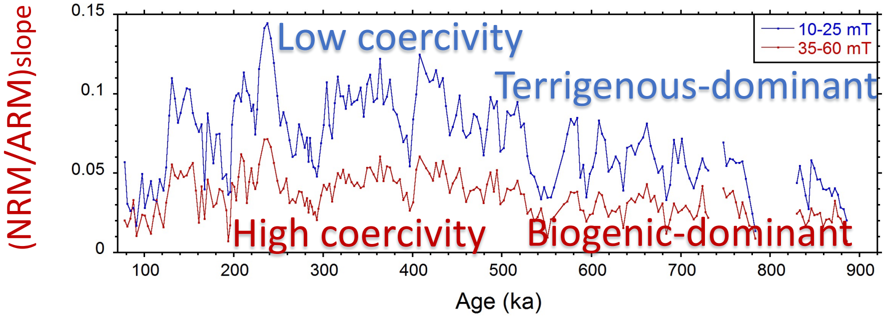
Relative proportions of biogenic to terrigenous components at different coercivity intervals were estimated from FORC diagrams.

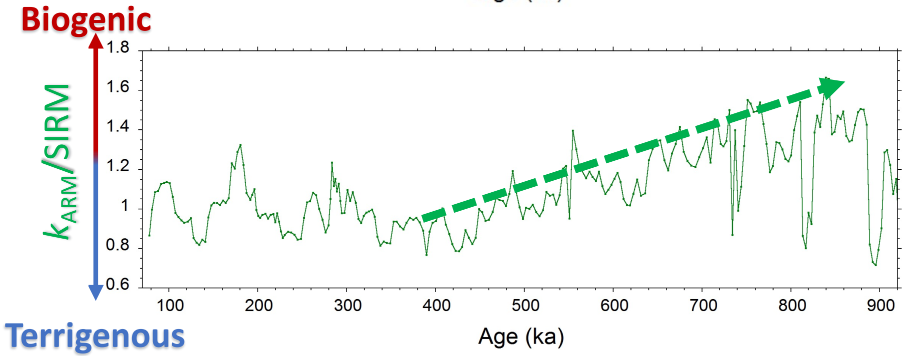


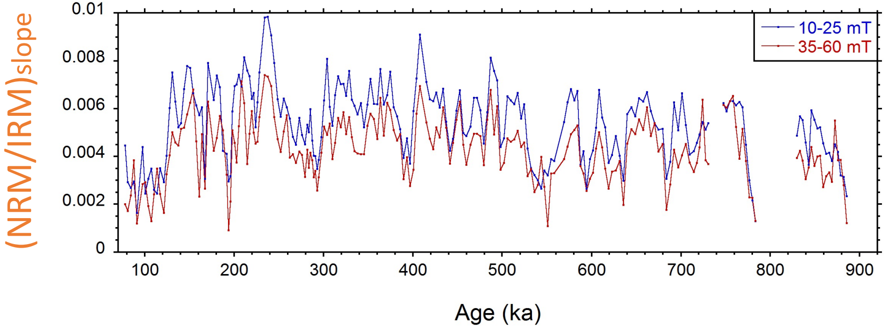
3. Results and interpretations

FORC diagrams indicate that the magnetization of the high-coercivity interval is carried more by biogenic magnetite.





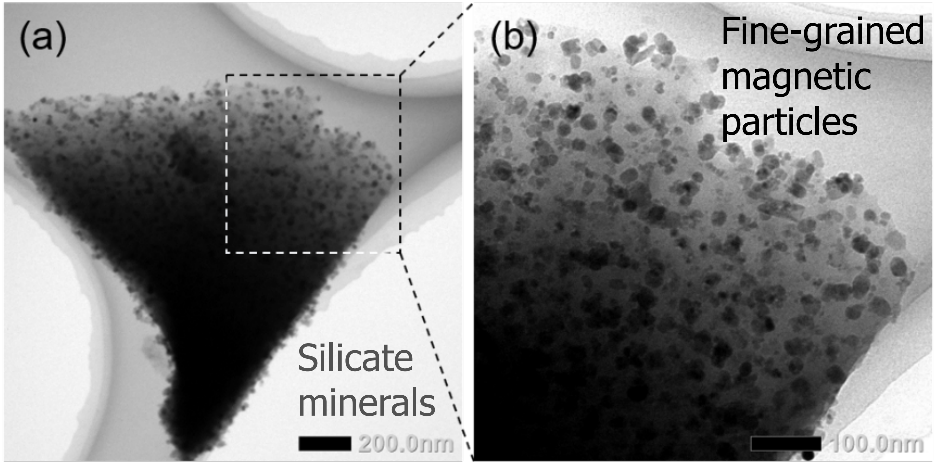




3. Results and interpretations

Possibility that silicate-hosted magnetic inclusions contribute to RPI as a major component is excluded.

- Silicate-hosted magnetic inclusions (quartz and feldspar) were extracted by chemical procedures.

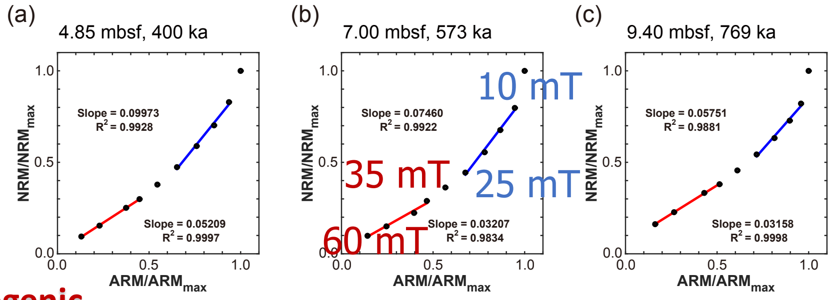


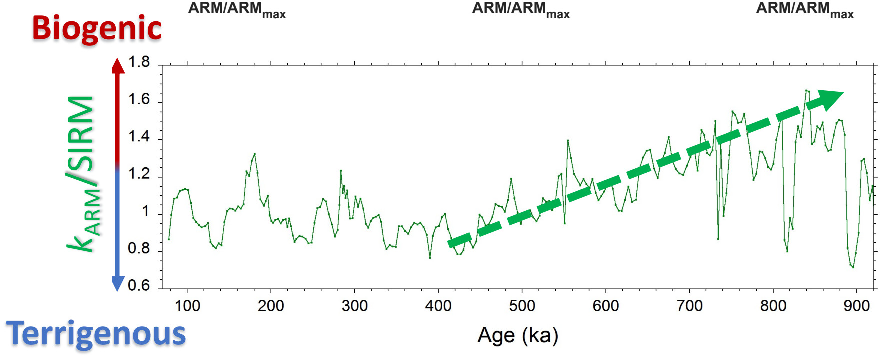
Less than <u>2% in mass</u> and only account for about <u>7% of SIRM</u> fractions.

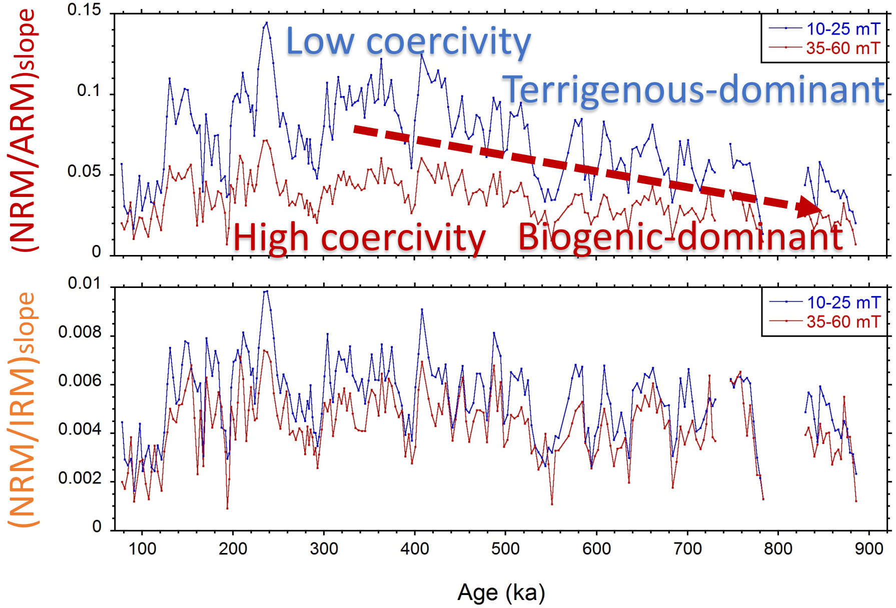
4. Discussion

ARM normalization is not appropriate for RPI estimation in sediments with changing amount of biogenic magnetite.

NRM/ARM



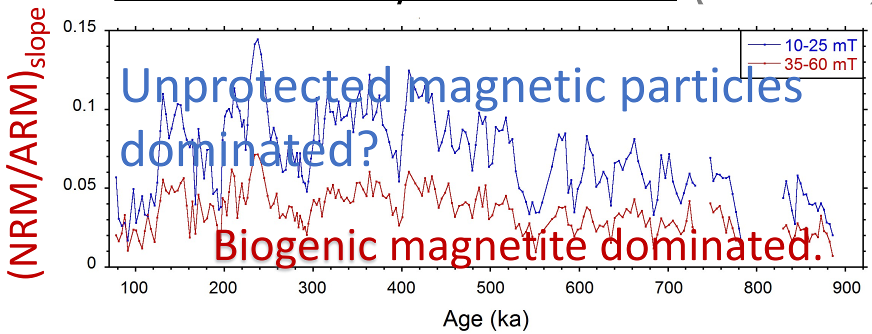




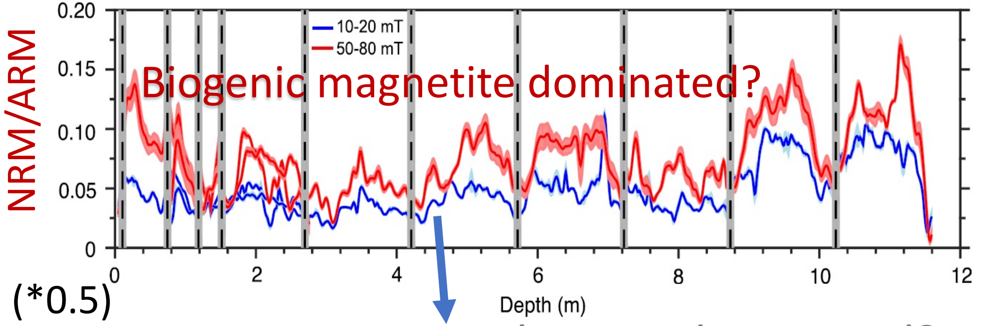
4. Discussion

Different concentrations of silicate-hosted magnetic inclusions might cause our results to be opposite to previous studies.

The western equatorial Pacific (this study)



The eastern equatorial Pacific [Chen et al., 2017]



RPI recording efficiency:

Unprotected magnetic particles > Biogenic magnetite > Magnetic inclusions

■ ***Sediment cores were from different sedimentary environments.***

5. Conclusions

- Biogenic magnetite contribute less to the RPI signal compared to the terrigenous magnetic minerals. This contradicts previous studies.

- Different magnetic-mineral components have different RPI recording efficiencies.

- Different silicate-hosted magnetic inclusion concentrations in different sedimentary environments is likely to be responsible for the observed differences among studies.