Phosphatised microstructures in ancient and modern phosphorites

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Phosphogenesis

- Occurs as distinct episodes in geologic time.

- Wide-spread in modern upwelling zones.
Phosphogenesis

• The concentration mechanism is strongly microbially mediated (S-oxidising bacteria).

Modified, Brock and Schulz-Vogt (2011)
Goals

• Fine-grained comparison of ancient and modern phosphorites.
• Identify potential remains of microbial communities.
• Implications for the interpretation of other ancient phosphorites.
Russian Karelia, 2.0 billion yr ago...
Cylindrical microstructures
Fossils?

- Phosphate minerals like to precipitate on nucleation templates.
- Cell membranes may act as such.

Benzerara (2004)
Fossilisation and recrystallisation
Mostly massive, but porous Ca-PO4
Ca-P cylinders
EDX
Doubts
Sampling

- „Diatomaceous ooze” at 23S (40 m)
- Mudbelt at 25S (47 m)
- Deeper shelf at 25.34S (301 m)
- Central shelf at 26S (198 m)
- Central shelf at 26S (116 m)
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Method

- Microstructure: SEM-EDX and FIB-TEM
- Geochemistry: XRD and LA-ICP-MS
Data

- High-resolution mineralogical and geochemical profiles.
- Porewater geochemistry and P speciation (Jake Bailey).
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- High-resolution mineralogical and geochemical profiles.
- Porewater geochemistry and P speciation (Jake Bailey).
- Detailed micro- and nanostructure.
- Authigenic phosphate?
Outlook

- Detailed comparison with ancient phosphorites.
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• Microorganisms as nucleation sites? If not, what then?
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• Transformation of microstructures towards depth.
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