Paleomagnetism of Devonian limestones in the West Qinling mountains, China

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1. Introduction

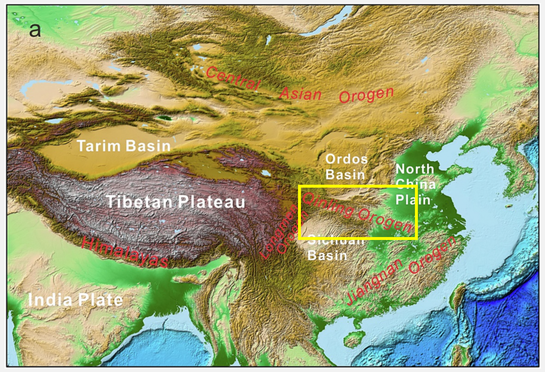

Figure.1. Topographic and the location map showing the Qinling Orogenic Belt (QOB)

The Qinling Orogenic Belt (QOB) traverses east-west across the central part of continental China. Being the suture of the North China Block and the South China Block, it represents a distinctive and typical composite continental orogenic belt that holds a prominent position in the formation and evolution of continental China. As an integral segment of the QOB, the West Qinling was originally formed by the collision of the North China block and the South China block during the Paleozoic and Triassic. It was superimposed by a Mesozoic and Cenozoic intracontinental orogeny. Thus it has undergone a prolonged history of formation and evolution. Devonian strata are central to our understanding of the QOB geology. However, their paleomagnetism is poorly known to date.

2. Methods

Here, we conducted a paleomagnetic study on Devonian limestone samples from the West Qinling (34.2°N, 103.1°E). For optimal results, a combination of thermal demagnetization and alternating field demagnetization was employed. In addition, M-T experiments were executed on a subset of representative samples.

Figure.2. Field photographs and magnetic measurement facilities

3. Results

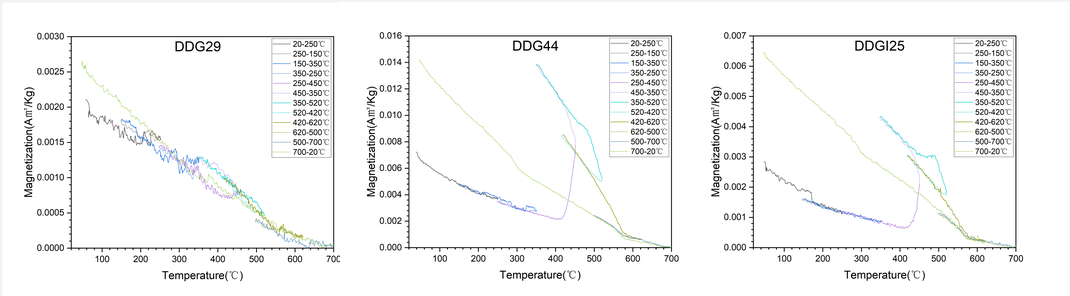

Figure.3. Representative Magnetization-Temperature Curves

- **Magnetization vs. Temperature Experiments (Fig. 3)**

The magnetization gradually decreases below ~420 °C, followed by a sharp rise from ~420 to 450 °C.

- **Demagnetization diagrams (Fig. 4)**

The demagnetization diagrams show two-component behavior of the natural remanent magnetization (NRM), with the medium and high temperature components tending to the origin (210~480℃). Thermal demagnetization is much more informative than alternating field demagnetization.

- **Normalized decay curves (Fig. 5)**

Most samples become noisy above 450℃, others already above 350℃ or even above a lower temperature.

- **Conodont Alteration Index (Fig. 6)**

The color of the conodonts is brown or dark grey-brown (CAI 2), corresponding to a paleotemperature of < 140°C.

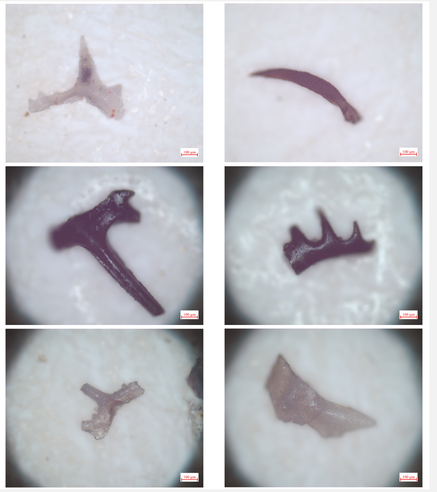

Figure.6. Microscopic photos of conodonts

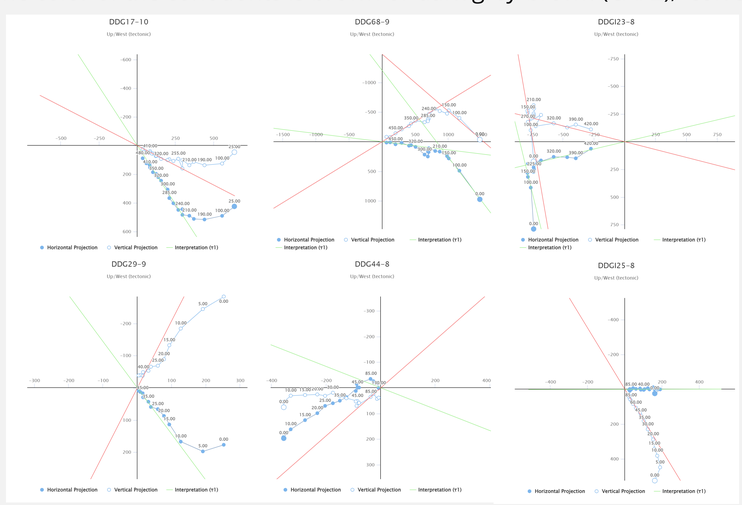

Figure.4. Representative Zijderveld diagrams for limestone samples

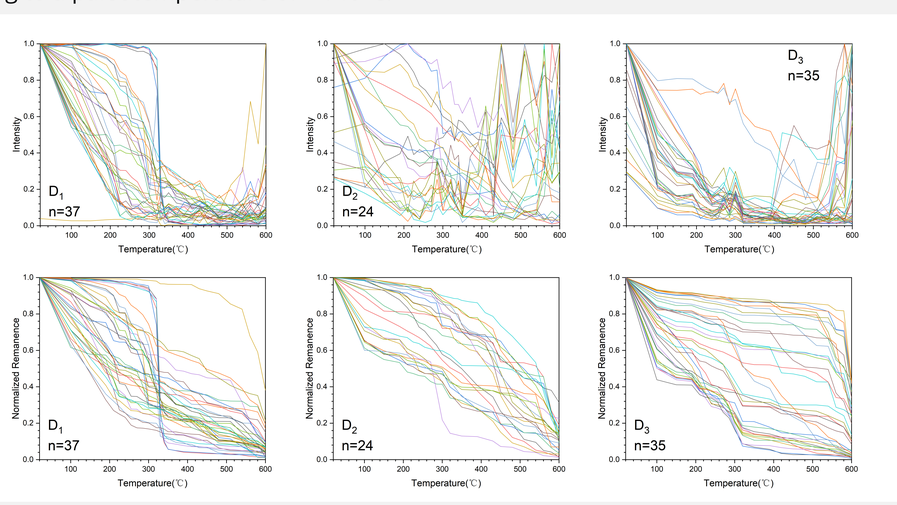

Figure.5. Curves of Intensity and Normalized remanence

4. Implications

- Many samples contain pyrite, which transforms into magnetite starting at temperatures of ~420℃.
- The main NRM carrier is fine-grained magnetite.
- Conodont Alteration Index values are low, indicating a low maximum burial temperature.
- In Devonian limestone samples from the West Qinling Mountains, there may be remagnetization caused by chemical changes.

5. What's next

- IRM acquisition curves
- End member modelling
- Handheld XRF

If you have any questions or suggestions, please contact me.

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References

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