

The Middle-Late Triassic closure of East Paleotethys Ocean:  
paleomagnetic evidence from the Baoshan Terrane, West Yunnan of  
China

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## Objective

So far there's still controversy about when, where and how the East Paleotethys Ocean closed due to the lack of reliable paleomagnetic data from the blocks or terranes located in both sides of the suture, which prohibits our better understanding of a series of key scientific issues such as how major blocks of East Asia collided together, and the relationship between the major blocks of East Asia and the Pangea supercontinent before its breakup. Therefore, this study reports paleomagnetic result from the limestones of Middle Triassic Hewanjie Formation of Baoshan Terrane, the northernmost extension of the Sibumasu Block (Fig1). We aim to accurately reconstruct paleogeographic position of the Baoshan Terrane during this time interval and further discuss the timing and position for the Sibumasu-Indochina Collision.

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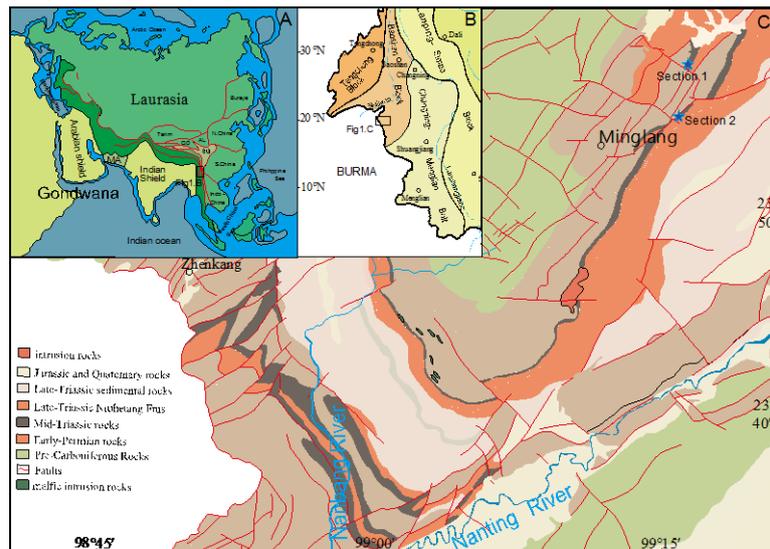


Fig. 1. (a) Schematic tectonic map of Eurasia showing the Cimmerian continent (b) the structural map around the Baoshan area (c) Geological map of southern Baoshan Terrane in West Yunnan

## Methods

Based on field investigation, 2 sections around the Minglang area of Yongde county were selected for sampling, and 9 sites embracing 108 samples were drilled with a portable gasoline-powered drill and oriented using magnetic compass. The samples were cut into standard cylindrical specimens ~2.0 cm in height. All the specimens were subject to hybrid demagnetization comprising progressive thermal demagnetization with temperature interval of 50 °C up to 250-300 °C followed by alternating field demagnetization with a field interval of 5mT below 30mT and 10mT up to 90mT. All the remanence measurements were performed on a 2G-755 cryogenic magnetometer. Both demagnetizer and magnetometer are installed in a magnetically shielded space with the field inside minimized to 300nT in the Paleomagnetism and Geochronology Laboratory of the Institute of Geology and Geophysics, Chinese Academy of Sciences.

## Results

In general, the demagnetization behaviour of the samples shows a character of 2 components. After the removal of a low temperature component below 300°C which is related to the overprint of present geomagnetic field (PGF), a stable high field component can be isolated from 10-30mT to 90mT from specimens. The high field components concentrated inside section, while the sub-mean direction of the two sections have similar inclination ~25° with a declination difference of ~32 ° which is compatible to strike azimuth difference of the strata, thus we think this is caused by local rotation relative to the fault activity (Fig 2). If we rotate the mean direction of the Section 2 to that of the Section 1, we can get a tilt-corrected mean direction of all sites with  $D_s=95.6^\circ$ ,  $I_s=26.2^\circ$ ,  $\alpha_{95}=1.8^\circ$ . Further fold test gives a negative result probably due to approximate strata dip of the two sections. Taking all things into consideration, we suggest that the high field component is probably of primary origin while further study is still needed.

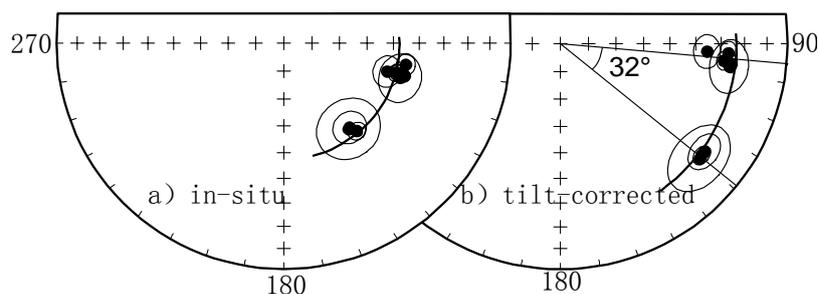


Fig2. Equal area of the site-mean high field component (a and b) directions of the Limestone from Middle Triassic Hewanjie formation in Baoshan terrane with corresponding 95% of confidence circle pre- and post- tilt correction.

## Conclusions

The mean direction of the ChRMs defines a paleolatitude of  $\sim 14^\circ\text{N}$  for the Baoshan Terrane. Taking together the previous paleomagnetic study of the Upper Triassic basalts from the Baoshan Terrane (Zhao et al., 2015), we think the Baoshan terrane is located at a low latitude around  $15^\circ\text{N}$  during the Middle-Late Triassic. Huang et al. (2016) reported that the Simao Terrane, northern extension of the Indochina is located at  $\sim 16^\circ\text{N}$  during the Late Triassic. Taking all things into consideration, we think that the East Paleotethys Ocean have already closed before or during the Middle-Late Triassic.

## Acknowledgments

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## References

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**Appendix 1 Summary of high field characteristic remanent magnetizations from Middle Triassic Hewanjie Formation, in the Yongde area of Baoshan Terrane.**

Site ID	$\lambda_s(^{\circ}\text{N})$	$\phi_s(^{\circ}\text{E})$	Strike/dip	n/n0	Dg( $^{\circ}$ )	Ig( $^{\circ}$ )	Ds( $^{\circ}$ )	Is( $^{\circ}$ )	$\kappa$	$\alpha_{95}(^{\circ})$	$\phi_p(^{\circ}\text{E})$	$\lambda_p(^{\circ}\text{N})$
Section1												
YY29	23.96	99.24	330/20	11/13	105.3	50.9	93.1	35.5	72.4	5.4	170.0	5.2
YY30	23.96	99.24	340/20	11/12	100	44.5	93.3	26.7	153.2	3.7	175.0	2.8
YY31	23.96	99.24	341/22	10/10	104.8	47.6	96.0	28.5	278.3	2.9	173.0	0.8
YY32	23.96	99.24	346/24	8/12	104.5	47.1	96.8	25.3	421.6	2.7	174.3	-0.7
YY33	23.96	99.24	341/23	8/10	106.7	45.4	97.8	25.8	46.6	8.2	173.7	-1.4
YY34	23.96	99.24	339/21	15/16	105.2	44.0	97	26.3	366.1	2.0	173.7	-0.6
Submean					104.1	46.6			718.7	2.5		
							95.7	28.0	367.2	3.5		
Section2												
YY39	23.92	99.26	13/31	8/11	140.3	48.1	128.5	21.5	300.4	3.2	176.4	-1.3
YY40	23.92	99.26	16/34	9/12	143	50.6	129.8	21.2	22.1	11.2	176.1	-2.6
YY41	23.92	99.26	11/35	8/12	142.1	50.9	127.1	21.5	89.1	5.9	177.0	-0.1
Submean					141.8	49.9			2084	2.7		
							128.5	21.4	4207	1.9		

Abbreviations are: site ID, site identification;  $\phi_s$ ,  $\lambda_s$ , latitude and longitude of the sampling site; Strike/dip, strike azimuth and dip of bed; n/n0, number of samples joined the calculation/demagnetized; Dg, Ig (Ds, Is), declination and inclination of direction in-situ (after tilt correction);  $\kappa$  and  $\alpha_{95}$ , precision and parameter and the radius on the cone of 95% confidence for mean direction;  $\phi_p$ ,  $\lambda_p$ , latitude and longitude of corresponding virtue geomagnetic pole (VGP) in stratigraphic coordinates.