

# Paleomagnetic study of the Late Jurassic formations in Northern Qaidam basin and tectonic implications

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According to the paleomagnetic study from the Upper Jurassic red beds along the Altyn Tagh Fault, some researchers suggest that the Jurassic blocks in the Altyn Tagh Fault show significant relative clockwise rotation with respect to Tarim basin ( $16.2^{\circ} \pm 11.2^{\circ}$ ), but they also point out whether this rotation was representative of the whole Qaidam basin or was of a local character (Halim et al. 2003). In order to understand the tectonic evolution of the Qaidam basin in Late Jurassic and to confirm this rotation, we carried out the paleomagnetic study on the Upper Jurassic red and brown mudstones collected at seven sites near the Lulehe profile ( $38.15^{\circ}$  N,  $94.69^{\circ}$  E) in the northern Qaidam basin. Thermal demagnetization up to  $685^{\circ}$  C shows both low- and high- temperature components (LTC and HTC, respectively). LTC lie close to the recent geomagnetic field and seem to be a recent overprint. The HTC, carried principally by haematite and presenting a sole reverse polarity, passed the fold test at the 95 per cent confidence level. The palaeomagnetic pole calculated from the tilt-corrected six sites mean direction ( $D_s = 216.6^{\circ}$ ,  $I_s = -20.4^{\circ}$ ,  $\alpha_{95} = 14.0^{\circ}$ ) is situated at  $47.2^{\circ}$  N,  $215.1^{\circ}$  E ( $dp/dm = 7.7/14.7$ ). The comparison of this result with coeval paleomagnetic poles from the western Qaidam basin ( $50.1^{\circ}$  N,  $198.0^{\circ}$  E,  $dp/dm = 5.0/8.6$ ) reveals no obvious rotation ( $5.4^{\circ} \pm 13.1^{\circ}$ ) during Late Jurassic. This study also suggests that the Qaidam basin was likely one block and could have rotated as a whole in the Late Jurassic. The differences of palaeolatitude ( $8.2^{\circ}$ ), while the present location is similar, perhaps is the result that the Altyn Tagh Faults, which were strike-slipping as left-lateral since the Late Mesozoic (Liu et al. 2001). Comparing this study to the coetaneous palaeomagnetic poles from Tarim, the North China

Block and the Eurasia (**Table 1**), the results suggest that northward convergence of the Qaidam block exists with respect to Tarim ( $14.3^{\circ} \pm 13.3^{\circ}$ ) since Late Jurassic, unlike the previous literature ( $4.5^{\circ} \pm 8.2^{\circ}$ ). A significant relative clockwise rotation of the Lulehe area with respect to Tarim basin seem to have occurred ( $11.1^{\circ} \pm 13.9^{\circ}$ ) without doubt. The overall NS convergence absorbed between Qaidam basin and Eurasia is  $29.0^{\circ} \pm 14.0^{\circ}$ , whereas that absorbed between the Qaidam and the NCB is  $17.1^{\circ} \pm 12.2^{\circ}$ . As mentioned in the previous literatures, we also think that the latter value is the result of the India-Asia collision, but the magnitude of convergence is not known.

## References

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TABLE 1. Selected palaeopoles used for comparisons

Block	Age	Lat.	Long.	$\lambda_p$	$\phi_p$	$p \lambda$	$A_{95}$ (dp/dm)	Reference
Eurasia	140Ma	-	-	71.6	173	-	10.4	Besse & Courtillot, 1991
Qaidam(Huatugou)	$J_3$	38.46	90.75	50.1	198.0	19.2	5.0/8.6	Halim et al., 2003
Qaidam(Lulehe)	$J_3$	38.15	94.69	47.2	215.1	10.5	7.7/14.7	This study
North China	$J_3$	31.6	116.0	74.4	222.8	26.0	5.9	Gilder & Courtillot, 1997
Tarim	$J_3$ to $K_1$	42.0	81.6	64.6	208.9	24.3	9.0	Li et al.1988