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Mesozoic and Cenozoic multiple deformations in the Helanshan Tectonic Belt, Northern China

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Abstract

The Helanshan Tectonic Belt (HTB) is located in the tectonic boundary between the Alxa massif and the Ordos Basin, and witnessed the tectonic processes between the Alxa massif and the Ordos Basin. The deformation structures in the Phanerozoic successions are keys to understanding the multiple phases of deformation along the HTB. Together with regional geology, our new geological mapping and structural analysis reveal that HTB has been formed at least by four phases of deformation during the Mesozoic and Cenozoic times. First phase of deformation (D_1) is represented by the WNW-trending open-folds of the Paleozoic and Triassic strata, and formed by NNE-SSW contraction. The angular unconformity between the deformed Paleozoic-Triassic strata and overlying Middle Jurassic strata constrains that D_1 occurred in the Early Jurassic. Second phase of deformation (D_2) is indicated by the NE-striking tight-folds of the Triassic and Jurassic strata, and the superimposed deformation on D_1 structures. Geometrical and kinematic analysis suggests that D_2 was constructed by a phase of NW-SE contraction. The angular unconformity between the

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