Tectonophysics 690 (2016) 362–366

Contents lists available at ScienceDirect

Tectonophysics

journal homepage: www.elsevier.com/locate/tecto

Comment on "Cenozoic tectonic deformation and uplift of the South Tian Shan: Implications from magnetostratigraphy and balanced cross-section restoration of the Kuqa depression" by Tao Zhang, Xiaomin Fang, Chunhui Song, Erwin Appel, and Yadong Wang [Tectonophysics, 2014, doi:10.1016/j.tecto.2014.04.044]

Qingqing Qiao [a,*], Baochun Huang [b], John D.A. Piper [c]

[a] Xinjiang Research Center for Mineral Resources, Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, Urumqi 830011, China
[b] Key Laboratory of Orogenic Belt of Crustal Evolution Ministry of Education, School of Earth and Space Sciences, Peking University, Beijing 100871, China
[c] Geomagnetism Laboratory, Department of Earth and Ocean Sciences, University of Liverpool, Liverpool L69 7ZE, UK

ARTICLE INFO

Article history:
Received 10 August 2015
Received in revised form 24 February 2016
Accepted 11 March 2016
Available online 12 March 2016

Keywords:
Magnetostratigraphy
Tianshan
Cenozoic
Uplift

ABSTRACT

The recent paper entitled: "Cenozoic tectonic deformation and uplift of the South Tian Shan: Implications from magnetostratigraphy and balanced cross-section restoration of the Kuqa depression" by Zhang et al. [Tectonophysics, 2014, doi:10.1016/j.tecto.2014.04.044] discusses the Cenozoic tectonic deformation and uplift of the South Tianshan Mountains by integrating tectonic investigations, seismostratigraphic analysis and paleomagnetic dating of the thrust–fold belt in the Kuqa Depression at the southern border of the Tianshan. To support their conclusions the authors have reinterpreted a high resolution magnetostratigraphic study of the Kezilenuer Section in a paper entitled "Magnetostratigraphic study of the Kuche Depression, Tarim Basin, and Cenozoic uplift of the Tian Shan Range, Western China" by Huang et al. [Earth and Planetary Science Letters Volume 251, pages 346–364 (2006)]. We note here (i) that apparent conflicts in definition of the Xiyu Formation in the Kuche Depression as proposed by Zhang et al. (2014) require amplification and (ii) argue that their age assignment for the Kezilenuer Section is incorrect and yields an anomalously low sedimentation rate for the infilling of this foreland basin.

1. Introduction

The Cenozoic uplift history of the Tianshan mountain range is important both for understanding intra-continental deformation and resolving the influence of this barrier on the climatic history of Central Asia (e.g. Tapponnier and Molnar, 1979; Yang et al., 2015), and extensive research over the past three decades has done much to unravel the orogenic history of this range (Avouac et al., 1993; Hendrix et al., 1994; Métivier and Gaudemer, 1997; Burchfiel et al., 1999; Bullen et al., 2001; Sun et al., 2004; Charreau et al., 2005, 2006; Huang et al. 2006; Jolivet et al., 2010; Yang et al., 2015). Magnetostratigraphic investigations have played a key part in this research because they are able to provide a temporal constraint to uplift history in terms of deposition rates of the terrigenous sequences shed into foreland basins where diagnostic floral or faunal constraints are largely absent (Sun et al., 2004; Charreau et al., 2005, 2006; Huang et al. 2006; Yang et al., 2015).

The recent study by Zhang et al. (2014) has conducted a paleomagnetic study for stratigraphic age determination in parallel with restoration of balanced cross-sections across the Kuqu Depression. A fossil mammal, *Hipparion chiai*, found in the Kuchetawu Section by Sun et al. (2009) and located in the same anticline embraced by their study yields a time interval of 5.4–2.6 Ma for the measured Erbatai Section. In addition they reinterpreted a magnetostratigraphic analysis of the Kezilenuer Section by Huang et al. (2006) to propose a ~10 Ma extension to the temporal duration of this latter section. Here we address two issues raised by their interpretation. Firstly we discuss the definition of the Xiyu Formation used by these authors and secondly we apply the new Dynamic Time Warping Algorithm technique to

* Corresponding author at: Xinjiang Research Center for Mineral Resources, Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, Beijing South Road 818, Urumqi 830011, China.
E-mail addresses: qiaoqq@ms.xjb.ac.cn, bchuang@pku.edu.cn (Q. Qiao).

http://dx.doi.org/10.1016/j.tecto.2016.03.011
0040-1951/

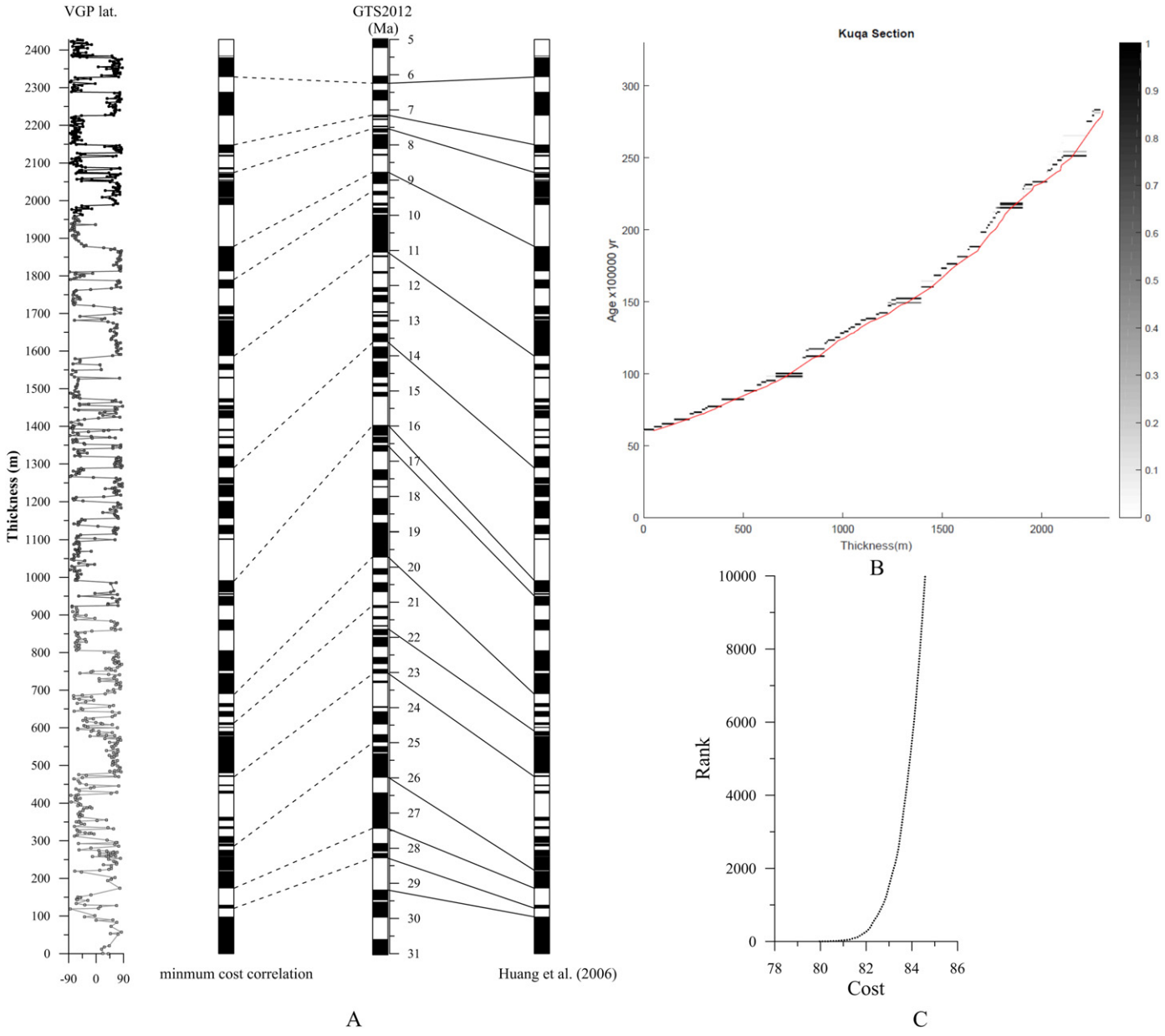

Fig. 1. (A) Magnetostratigraphic correlation of the Kezilenuer Section comparing the minimum cost correlation (Lallier et al., 2013) with the correlation as originally proposed by Huang et al. (2006). (B) Weighted density age versus depth plot of the 10,000 best correlations computed considering all polarity zones by Julien Charreau. (C) Cost-rank function for the 10,000 best correlations considering all sampled polarity changes.

argue that their revised age span for the magnetostratigraphy of the Kezilenuer Section is incorrect.

(1) Definition of the Xiyu Formation

In their magnetostratigraphic study of the Erbatai section, Zhang et al. (2014) recognize the first appearance of a thick dark gray conglomerate bed succeeded by dominant conglomerate deposition as the base of the Xiyu Formation. Unfortunately this confuses the definition of the Xiyu. As originally proposed by Huang et al. (1947), this formation was assigned to a suite of typical massive molassic deposits comprising dark-gray pebble to boulder conglomerates with minor interbeds of mudstone or sandstone at the base of the Dushanzi Section in the northern Tianshan (Huang et al., 1947) where these conglomerates rest upon the underlying Neogene Dushanzi formation with clear unconformity as evidenced by a remarkable difference in lithology and bedding attitudes. This description implies that the Xiyu is a coherent and continuous unit lying at the top of the sedimentary pile in central Asian foreland basins. However, over a wider area the Xiyu conglomerates are seen to be variable transgressive deposits which progressively cover underlying formations such as the Dushanzi, Kuche, and Atushi formations in southern Junggar, Kuche, and Kashi depressions respectively. The transition from predominantly argillaceous/arenaceous to rudaceous deposition is typically characterized by highly variable lithological proportions of massive planar and cross-bedded conglomerates of pebble to blocky clasts with a matrix of alternating claystones, siltstones and sandstones (Charreau et al., 2009). Thus wider regional definition of the base of the Xiyu Formation remains controversial. At Kekeya for example, the first appearance of pebble conglomerate is defined as the base of another formation name, the Artux, by Zheng et al. (2010, 2015) while Sun et al. (2004) find that late Pliocene conglomerates with interbedded siltstones or mudstone only gradually give way upwards to dominant conglomerates