

## Accepted Manuscript

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PII: S1342-937X(16)30340-9  
DOI: doi: [10.1016/j.gr.2017.07.012](https://doi.org/10.1016/j.gr.2017.07.012)  
Reference: GR 1847

To appear in:

Received date: 11 November 2016  
Revised date: 28 June 2017  
Accepted date: 30 July 2017

Please cite this article as: Tianyu Zhao, Qinglai Feng, Ian Metcalfe, Luke A. Milan, Guichun Liu, Zhibin Zhang , Detrital zircon U-Pb-Hf isotopes and provenance of Late Neoproterozoic and Early Paleozoic sediments of the Simao and Baoshan blocks, SW China: Implications for Proto-Tethys and Paleo-Tethys evolution and Gondwana reconstruction, (2017), doi: [10.1016/j.gr.2017.07.012](https://doi.org/10.1016/j.gr.2017.07.012)

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Detrital zircon U-Pb-Hf isotopes and provenance of Late Neoproterozoic and Early Paleozoic sediments of the Simao and Baoshan blocks, SW China: Implications for Proto-Tethys and Paleo-Tethys evolution and Gondwana reconstruction

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**Abstract:** Early Paleozoic evolution of the northern Gondwana margin is interpreted from integrated in situ U-Pb and Hf-isotope analyses on detrital zircons that constrain depositional ages and provenance of the Lancang Group, previously assigned to the Simao Block, and the Mengtong and Mengdingjie groups of the Baoshan Block. A meta-felsic volcanic rock from the Mengtong Group yields a weighted mean  $^{206}\text{Pb}/^{238}\text{U}$  age of  $462 \pm 2$  Ma. The depositional age for the previously inferred Neoproterozoic Lancang and Mengtong groups is re-interpreted as Early Paleozoic based on youngest detrital zircons and meta-volcanic age. Detrital U-Pb zircon analyses from the Baoshan Block define three distinctive age peaks at older Grenvillian (1200–1060 Ma), younger Grenvillian (~960 Ma) and Pan-African (650–500 Ma), with  $\epsilon\text{Hf}(t)$  values for each group similar to coeval detrital zircons from western Australia and northern India. This suggests that the Baoshan Block was situated in the transitional zone between northeast Greater India and northwest Australia on the Gondwana margin and received detritus from both these cratons. The Lancang Group yields a very similar detrital zircon age spectrum to that of the Baoshan Block but contrasts with that for the Simao Block. This suggests that the Lancang Group is underlain by a separate Lancang Block. Similar detrital zircon age spectra suggest that the Baoshan Block and the Lancang Block share common sources and that they were situated close to one another along the northern margin of East Gondwana during the Early Paleozoic. The new detrital zircon data in combination with previously published data for East Gondwana margin blocks suggests the Early Paleozoic Proto-Tethys represents a narrow ocean basin separating an “Asian Hun superterrane” (North China, South China, Tarim, Indochina and North Qiangtang blocks) from the northern margin of Gondwana during the Late Neoproterozoic–Early Paleozoic. The Proto-Tethys closed in the Silurian at ca. 440–420 Ma when this “Asian Hun superterrane” collided with the northern Gondwana margin. Subsequently, the Lancang Block is interpreted to have separated from the Baoshan Block during the Early Devonian when the Paleo-Tethys opened as a back-arc basin.

**Keywords:** Gondwana; Proto-Tethys; Baoshan and Simao blocks; Detrital zircon ages; Paleogeography

## 1. Introduction

Assembly of the Gondwana supercontinent took place in the Late Precambrian–Early Paleozoic (Cawood and Buchan, 2007). Present-day East and mainland Southeast Asia comprises a collage of tectonic blocks, namely North and South China, Tarim, Indochina, North Qiangtang, Sibumasu, South Qiangtang and Lhasa. These blocks are interpreted to have successively rifted from Gondwana and accreted to Eurasia during the Paleozoic and Early Mesozoic. This process involved the opening and closure of three paleo-oceans, the Paleo-Tethys, Meso-Tethys and Ceno-Tethys (Metcalfe, 2013). Recent studies of ophiolitic components within suture zones of the south-west region of China (Longmu Co-Shuanghu Suture Zone in Tibet and Changning-Menglian Suture Zone in the San-Jiang region) have revealed evidence of a far older paleo-ocean in the Early Paleozoic (Zhai et al., 2010, 2016; Wang et al., 2013a; Peng et al., 2014b). This older ocean basin was named Proto-Tethys as an interpreted predecessor of Paleo-Tethys

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