

Lithospheric mantle of North China Craton is instinctly rich in gold?

ZAICONG WANG¹, HUAI CHENG¹, KEQING ZONG¹,
YONGSHENG LIU¹, YINHUI YANG², FUYUAN WU²
STEPHEN FOLEY³

¹ GPMR, School of Earth Sciences, China University of Geosciences,
388 Lumo Road, 430074, Wuhan, China, [*wzc231@163.com](mailto:wzc231@163.com)

² Institute of geology and geophysics, Institutions of Earth Science,
China Academy of Sciences, Beijing 100029, China

³ ARC Centre of Excellence for Core to Crust Fluid Systems,
Macquarie University, North Ryde, 2109, Australia

Giant lode gold deposits (> 5000 tons) in the North China Craton (NCC) cannot be designated as crustal metamorphism-related orogenic gold deposits [1]. Instead, the metasomatized subcratonic lithospheric mantle (SCLM) of the NCC is thought to play a key role, because these deposits occurred coeval with extensive cratonic destruction and inherit a strong signature of mantle volatiles [2]. Gold contents previously reported on mantle xenoliths from the NCC show a large range of 0.5-38 ng/g with a mean value of 5 ng/g (median 3.5 ng/g, compiled in [3]). These data, if correct, would imply that the SCLM of the NCC was inherently gold-rich at all times from the Archean to the Phanerozoic, distinct from any other mantle domain worldwide, including those that have experienced strong metasomatism and refertilization (e.g., < 1-2 ng/g Au, [3,4]).

To better understand the extent of gold enrichment in the lithospheric mantle of the NCC and the mechanisms and scope of its contribution to giant gold deposits, we developed a robust method for determining gold with a very low concentration (> 0.01 ng/g) by internal standardization [4] of gold to platinum and/or standard addition. Peridotite xenoliths with Archean to Paleoproterozoic and Phanerozoic Re depletion model ages were analyzed to assess secular changes in the gold content in the SCLM of the NCC. Our new data (mostly < 1 ng/g), including on samples from the same localities (Hebi, Mengyin, Shanwang), indicate that extensive metasomatism did replenish a fraction of Au to the highly depleted SCLM, but the amount must have been limited. Thus, the SCLM of the NCC is not a unique mantle domain highly rich in gold relative to the normal mantle of 1-1.5 ng/g [3, 4]. Further understanding the transfer of gold from the metasomatized mantle source to mafic magmas will provide critical insights on the origin of giant gold deposits in the NCC.

[1] Goldfarb et al. *Geoscience Frontiers* 2014, 5(2): 139-153.

[2] Zhu et al. *Science China Earth Sciences* 2015, 58(9): 1523-1537. [3] Saunders et al. *Lithos* 2018, 322: 376-391. [4]

Fischer-Gödde et al. *Chem Geol* 2011, 280(3-4): 365-383.