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Uniqueness of the Jiaodong terrane constrained by the Penglai Group, Eastern China

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The Jiaodong terrane, located to the east of the Tan-Lu Fault, consists of the Jiaobei uplift block in the northwest, the Jiaolai basin in the southwest and the Sulu orogen in the east. The Jiaobei block is the most prospective area for gold deposits in China, with proven reserves up to 5000 t Au. The gold deposits, are commonly hosted in Mesozoic granites and early Precambrian high-grade metamorphic basement rocks, and are mineralized within a short period at 120 ± 10 Ma. It is therefore a question why so many gold deposits formed within such a limited region and a short time span.

The Penglai Group, the youngest basement rocks in the Jiaobei block, unconformably overlies Paleoproterozoic metasedimentary rocks. However, the sedimentary age of this unit has been confirmed, and is debated as being late Proterozoic or mid-late Paleozoic, and a regional correlation of this group is not established. The sedimentary age and source region are crucial clues to reconstruct the tectonic evolution of the Jiaobei block.

We selected a typical section of the Penglai Group to the east of Qixia city for detailed study. The sequence is successive and suffered only low grade metamorphism. The lithology mainly includes phyllite, slate, quartz-rich sandstone and limestone. Paleo-regolith and basal conglomerate can be observed at the bottom of the formation covering the Paleo-proterozoic Fenzishan Group.

Detrital zircons from a siltite in the Penglai Group are identified as magmatic origin zircons, according to their Th/U ratio and CL features. They show three concordant U-Pb age populations, i.e. ~ 1.6 Ga, ~ 1.2 Ga and ~ 470 Ma as peak ages. The zircon age of 470 Ma, constrains the earliest sedimentary age, and is reported for the first time in the Penglai Group.

Other authors have observed detrital zircon age populations of 1.6 Ga and 1.2 Ga in the Penglai Group. Li et al. (2007) proposed that its sedimentary age is 1000-800 Ma and the source region is the Yangtze Craton. Chu et al. (2011) considered the sedimentary age should be later than 986 Ma, and the source region should consist of an area characterized by the Greenville period tectono-thermal event, which is different from either North China or Yangtze Cratons.

The occurrence of the 470 Ma age is very rare in the neighbouring area and the source region is vague. Zhang et al. (2011) reported ages of 419-487 Ma in the captured zircons from Cenozoic basalt in Liaodong Peninsula. Detrital zircons of 459-462 Ma were also found in sandstone from the Cretaceous Laiyan Group in the Jiaolai Basin.

Our data indicate that the Penglai Group was deposited later than the Ordovician. However, no correlated strata in the same era are documented in the North China Craton. According to the detrital zircon age population, the source region character is peculiar and shows affinities to both the North China and Yangtze Cratons, or other unrecognized source. Therefore, the Jiaobei block could be a

unique geological unit with more complicated evolution history, which might constrain the distribution of the gold deposit.

