Geochronology and kinetics of the Shapinggou porphyry Mo deposit in Jinzhai, eastern Qinling-Dabie orogenic belt

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The east-west trending Qinling-Dabie orogenic belt formed through the collision of the North China craton and the Yangtze block in early Mesozoic. This belt holds the world's most significant Mo ore province that is mainly situated along the southern margin of the North China craton, including the Jinduicheng, Nannihu-Sandaozhuang, Shangfanggou and Donggou super-large Mo deposits mainly of late Mesozoic in age. Several Mo deposits have been also discovered recently in northern Dabie terrain. This terrain is bordered by the Luanchuan-Gushi fault to the north and by the Xiangfan-Guangji fault in the south. The Shapinggou Mo deposit, being estimated as the largest Mo deposit in China, is one of several newly found Mo deposits in the Dabie region. All the Mo deposits in the Qinling and Dabie areas are directly related to Mesozoic magmatic rocks of different compositions.

In the field observation, we can find that the Mo mineralization occurs in veins and stockworks and is hosted both in granite porphyry and quartz syenite porphyry. Model ages achieved by the Re-Os isotopic analysis on molybdenite and U-Pb ages of zircons from the granite porphyry and quartz syenite porphyry, obtained from the LA-ICP-MS technique, demonstrate that the Mo mineralization is almost simultaneous with the formation of the ore-bearing porphyry, which is consistent with the early to middle Cretaceous Mo mineralization in the eastern part of the Qinling orogenic belt. During this time, the eastern China was characterized by rapid extension, lithospheric thinning, and asthenospheric upwelling. These tectonic activities possibly triggered partial melting of the crust. The Mo mineralization in northern Dabie, represented by the Shapinggou porphyry Mo deposit, likely occurred in such a geodynamic setting.
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Global impacts of the Antarctic Circumpolar Current appearance on nutrient distributions and biogeochemistry

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Abstract

At present, the Southern Ocean is the global nexus for upwelling of deep, nutrient rich waters, and provides the primary supply of nutrients to low latitudes. However, this was not always the case. Prior to the opening of the Drake Passage (DP) ~30 Ma, there was no Circumpolar Current, necessitating a very different return pathway for nutrients from the deep ocean to the surface. Paleo-records therefore provide an opportunity to better understand the global implications of the circumpolar current. However, understanding paleo-records spanning this transition are complicated by the closing of the Panama Isthmus (PI), which appears to have occurred sometime later. Here, we investigate the interactions between these two events, and the implications for marine biogeochemistry, using CM2Mc, a lower resolution version of the standard Geophysical Fluid Dynamics Laboratory (GFDL) fully coupled earth system model, with the BLING biogeochemical module. We carry out four runs : closed PI / opened DP, opened PI / opened DP, opened PI / closed DP, closed PI / shallow DP. The gateways have large impacts on the upwelling flux of nutrients to the Southern Ocean, and their redistribution to low latitudes (as shown in figure 1). They also impact the ventilation of the deep ocean, with implications for re-mineralized nutrients and therefore atmospheric pCO2.

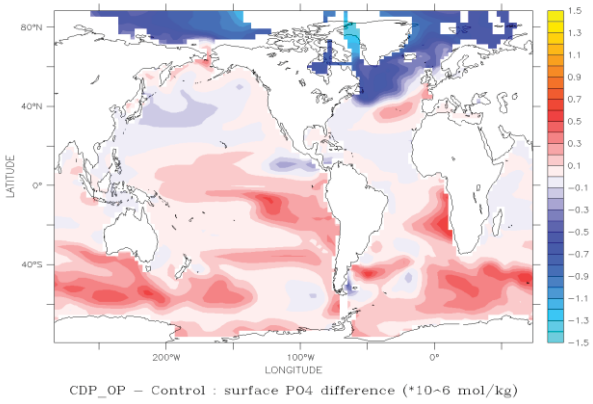

Figure 1: Difference in surface phosphate upon closing the drake passage.