Permian ice volume and palaeoclimate history: Evidences from oxygen isotope of conodont apatite

BO CHEN[1]*, MICHAEL M. JOACHIMSKI[2], SHU-ZHONG SHEN[1], LANCE L. LAMBERT[3], XU-LONG LAI[4], XIANG-DONG WANG[1], JUN CHEN[5] AND DONG-XUN YUAN[1]

[1]State Key Laboratory of Palaeobiology and Stratigraphy, Nanjing Institute of Geology and Palaeontology, 39 East Beijing Road, Nanjing 210008, China (*correspondence: chenbo@nigpas.ac.cn)

[2]GeoZentrum Nordbayern, Universität Erlangen-Nuremberg, Schlossgarten 5, 91054 Erlangen, Germany

[3]Department of Geological Sciences, The University of Texas at San Antonio, One UTSA Circle, San Antonio, TX 78249, USA

[4]State Key Laboratory of Biogeology and Environmental Geology, China University of Geosciences, Wuhan, Hubei 430074, China

[5]State Key Laboratory of Isotope Geochemistry, Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, Guangzhou 510640, China

A high-resolution oxygen isotope record based on conodont apatite from several low latitudinal sections in South China was obtained in order to unravel Permian palaeotemperature and ice volume history.

Permian oxygen isotope record measured on conodonts from South China exhibits relative high values between 22 and 23‰ VSMOW during the glaciated Early Permian, translating into warm seawater temperature between 26 and 30 °C, assuming that the Late Palaeozoic ice volumes were comparable to the Pleistocene glacial maxima. In contrast to the earlier view that the Late Palaeozoic Ice Age (LPIA) terminated in the late Sakmarian, the South China conodont apatite oxygen isotope record suggests waning of the ice sheets in the Kungurian. Ice melting is indicated by a pronounced decrease in $\delta^{18}O$ of 2‰ VSMOW, which is interpreted as reflecting the combined effect of climatic warming and glacial ice melting.

4 °C warming succeeded by 6 to 8 °C cooling are observed during the Guadalupian–Lopingian transition, interpreted as combined climate changes induced by Emeishan volcanism and changes in habitat depth of gondolellid conodonts. Oxygen isotope values increase to 22‰ VSMOW in the Changhsingian, which suggests climate cooling and *Clarkina* moving to deeper waters because of the Changhsingian sea level rise. Across the Permian-Triassic boundary, $\delta^{18}O$ values decrease from 22 to 19‰ VSMOW, parallel to the significant negative carbon isotope excursion.