## METHODS

Conodonts for a taxonomic study were extracted using standard methods (Jiang et al, 2007). We analysed mono-generic samples of *Hindeodus* and *Clarkina* (P1 elements) in case of abundant faunas. Ramiform elements of both taxa were used in case of less abundant specimens. Only conodont elements without basal bodies were selected for further processing since the basal bodies have shown to be a potential source of contamination (Wenzel et al. 2000). Conodonts were dissolved in $HNO_3$ and the phosphate group was precipitated as trisilverphosphate following the method described in Joachimski et al. (2009). Oxygen isotope analyses were performed on $Ag_3PO_4$ using a TC-EA (high temperature reduction furnace) coupled online to a ThermoFisher Delta Plus mass spectrometer. 0.2 to 0.3 mg $Ag_3PO_4$ was weighed into silver foil and transferred to the sample carousel of the TC-EA. Samples and internal standards are generally measured in triplicate. All oxygen isotope values are reported in ‰ relative to VSMOW (Vienna Standard Mean Ocean Water). Reproducibility of triplicate sample measurements is generally <±0.2‰ (1 std.dev.). The average oxygen isotopic composition of the internationally distributed standard material NBS 120c was 22.6±0.16‰ VSMOW.

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Table DR1: Oxygen isotope ratios of conodonts from the Meishan and Shangsi sections (South China). Paleotemperatures are calculated using the equation given by Pucéat et al. (2010) assuming a $\delta^{18}O$ value for Late Permian sea water of -1‰ VSMOW

| Sample | Bed no. | $\delta^{18}O$ (‰VSMOW) | | | T (°C) |
|---|---|---|---|---|---|
| | | *Clarkina* sp. | *Hindeodus* sp. | ramiforms | |
| **Meishan B & C sections** | | | | | |
| MSC 33 | MSC 29 | | 18.8 | | 35.1 |
| MSC 32 | MSC 28 | | 19.3 | | 32.9 |
| MSC 31 | MSC 27d | 20.4 | 19.4 | | 28.5 / 32.8 |
| MSC 30 | MSC 27c | 20.4 | 19.4 | | 28.3 / 32.5 |
| MSC 29 | MSC 27b | | 19.5 | | 32.1 |
| MSC 28 | MSC 27a | 20.0 | 19.4 | | 29.9 / 32.6 |
| MSC 27 | MSC 26 | 21.0 | | | 25.9 |
| MSC 26 | MSC 24f-1 | 20.9 | | | 26.3 |
| MSB 25 | MSB 24f | 21.3 | | | 24.6 |
| MSC 23 | MSC 24e Top | 21.3 | | | 24.6 |
| MSC 24 | MSC 24e | 21.6 | 21.2 | | 23.2 / 25.2 |
| MSC 22 | MSC 24e | 21.0 | | | 25.9 |
| MSC 21 | MSC 24d | 21.1 | 21.2 | 20.8 | 25.3 / 25.0 / 26.8 |
| MSC 20 | MSC 24d-4 | 21.4 | | | 24.2 |
| MSC 19 | MSC 24d-3 | 21.4 | | | 24.2 |
| MSC 18 | MSC 24d-2 | 21.6 | | | 23.3 |
| MSC 17 | MSC 24d-1 | 21.0 | | | 25.9 |
| MSC 16 | MSC 24c | | 21.2 | | 25.0 |
| MSC 15 | MSC 24c-2 | 21.2 | | | 25.9 |
| MSC 14 | MSC 24c-1 | 21.0 | | | 25.0 |
| MSC 13 | MSC 24c | 20.7 | | | 27.1 |
| MSC 12 | MSC 24b | 20.7 | 20.6 | | 27.0 / 27.6 |
| MSC 11 | MSC 24a | 21.2 | 21.2 | 21.0 | 25.0 / 25.0 / 26.1 |
| MSC 10 | MSC 24a | 21.3 | | | 24.6 |
| MSC 9 | MSC 24a base | 21.5 | | | 23.8 |
| MSC 8 | MSC 23-7 | 22.0 | | | 21.6 |
| MSC 7 | MSC 23-4 | 22.0 | | | 21.6 |
| MSB 6 | MSB 23-3 | 21.9 | | | 22.1 |
| MSB 5 | MSB 23-1 | 22.3 | | | 20.4 |
| MSC 4a | MSC 23 | 22.3 | | | |
| MSB 4 | MSB 23-1 base | 21.3 | | | 24.6 |
| MSB 3 | MSB 22 top | 21.8 | | | 22.5 |
| MSC 2 | MSC 22-15 | 21.6 | | | 23.3 |
| MSC 1a | MSC 22c | 21.3 | | | |
| MSC 1 | MSC 22-14 | 21.6 | | | 23.3 |
| **Shangsi section** | | | | | |
| | 33 | | 18.7 | | 35.5 |
| | 32 | | 19.3 | | 33.0 |
| | 31b | | 19.0 | | 34.3 |
| | 31a | | 19.0 | | 34.3 |
| | 30d | | 18.9 | | 34.8 |
| | 28c | 19.5 | | | 32.0 |
| | 27c | 20.0 | | | 30.2 |
| | 27a | 21.4 | | | 24.1 |
| | 26 | 21.6 | | | 23.3 |