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A noble gas temperature record from the North China Plain

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The North China Plain (NCP) is the largest alluvial plain in East Asia and consists of deposits of the Yellow River. It is one of the most densely populated areas of the world with great agricultural importance for China. The climate is temperate continental, influenced by the south-east monsoon. We conducted an environmental tracer and noble gas temperature study using more than 50 groundwater wells in the deep confined aquifer system of the northern part of the NCP, the aquifer that is actually used for irrigation and drinking water. Objective was the determination of the climatic signal of the transition from the last glacial maximum to the Holocene using the noble gas thermometer and the stable isotopes ^{2}H and ^{18}O as climate indicators and ^{14}C to obtain a time scale. Noble gas concentrations in water vary with temperature as the solubilities are temperature dependent. Measurements of noble gases in paleo-groundwater can therefore be used to calculate paleo recharge temperatures. The importance of this method lies in reliable determination of glacial-interglacial temperature differences. The age of the groundwater in the NCP reaches from very young water to 30 kyr old water in the deeper parts of the aquifers. Comparing the mean recharge temperature of Holocene and late Pleistocene samples indicates a glacial cooling of about 4°C.

The correlation between noble gas temperatures and stable isotopes is important for the climatic interpretation of other stable isotope records from sediments or stalagmites. Our data show that the modern temperature-δ^{18}O correlation should not be used for interpretation of paleo-samples in this study region.