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Provenance and depositional environments of the late Neogene Red Clay deposits in Northern China based on detrital zircon and heavy mineral analysis

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The late Miocene - Pliocene (about 11-2.5 Ma) time is the latest period of undisturbed global warmth before the onset of glacial times. Pliocene climate state is proposed as almost an analogue for future global climate by the end of 21st century and has been focus of much research. The Neogene red earth underlying the Pleistocene loess – paleosol deposits in northern China, has been demonstrated to have a relatively continuous depositional character at least over the past ∼7-8 to ∼2.6Ma. These Red Clay deposits are not only important continental archives of late Miocene-Pliocene environmental and climatic changes, but also preserve significant information on past atmospheric circulation patterns. Multiple competing hypotheses have been proposed for the provenance of Red Clay deposits of the Chinese Loess Plateau (CLP), yet none has been confirmed. Whether it is sediments derived from single or multiple source areas still remains ambiguous. U-Pb age dating of detrital zircons from clastic sediments has proved to be powerful tool to trace sediment sources. However, this method is seldom applied in constraining the provenance of Red Clay deposits.

In this study, we selected three typical Red Clay sections across the northern China. They are Dongwan in the western part, Lantian in the southern part and Baode in the northeastern part of the CLP. Based on the systematic field geologic survey, stratigraphic investigation and magnetostratigraphy, 15 samples in different stratigraphic levels were chosen. By applying the zircon U-Pb dating and single grain zircon morphology, combined with heavy mineral analysis of the Red Clay samples, the research aims to investigate the source and spatio-temporal evolution of Neogene Red Clay deposits of northern China. This study has significant implications for understanding the Red Clay depositional environments and will give insight into the past wind systems responsible for transporting dust onto the Chinese Loess Plateau.