Paper Number: 4370

Organic carbon isotope and molecular fossil records of vegetation evolution in central Loess Plateau since the late Quaternary

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Chinese Loess Plateau (CLP) is the cradle of the Chinese nation, and over the past thousands of years, agricultural activities have almost completely destroyed all natural vegetation in the region. Today's vegetation distribution has undoubtedly been influenced by the impact of both nature and human activities (Guo and Hou, 2010). The variety of vegetation types and the evolution of vegetation over time on the Chinese Loess Plateau is not only an important issue in the field of regional past global change, but is also of practical significance in terms of management of CLP's modern ecological environment, ecosystems and carbon sequestration potential. However, significant uncertainties remain regarding the temporal evolution and pattern of natural vegetation during the Quaternary, and drivers of past vegetation change, on the Chinese Loess Plateau (CLP). This study presents analyses of total organic carbon isotopic composition (TOC) and n-alkane ratios (C31/C27) from the Lingtai loess-palaeosol sequence on the central CLP over the last 450 ka. The results demonstrate that the vegetation in this region comprised a mix of C_3 and C_4 plants of herb and woody growth-form (Zhou et al., 2009). C_3 plants dominated for most of the last 450 ka, but this did not lead to extensive forest. C_3 woody plants were more abundant in MIS9 (S3 period) and MIS5 (S1 period) during warm and humid climate conditions. Herbs increased in the region since 130 ka, possibly as a result of increased aridity. On the orbital timescales, there was a reduction of C_3 herbal plants in MIS11 (S4) and Holocene (S0) than in MIS12 (L5) and the last glacial period, respectively, and in other glacial cycles, C_3 herbal plants increased in interglacial periods compared to the glacial periods.Our isotope and n-alkane vegetation proxy records are in agreement with *Artemisia* pollen changes in the region, which is/was the dominant species in this area and varying due to different heat and water conditions between glacial and interglacial periods. Though the climate in MIS1 (S0) was similar to that in MIS11 (S4), a significant increase in tree cover during the Holocene suggests the impact of human activities and ecological effects of changes in fire activity (Zhou et al., 2014).

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