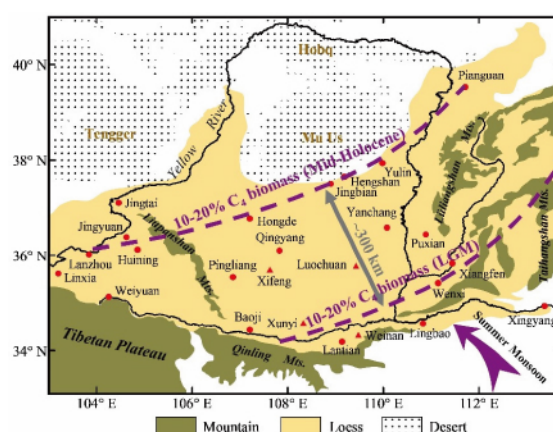


## Global warming will shift the East Asian monsoon rain belt northward

With the support by the National Natural Science Foundation of China and the Chinese Academy of Sciences, the research team led by Prof. Yang ShiLing (杨石岭) and Prof. Ding ZhongLi (丁仲礼) at the Key Laboratory of Cenozoic Geology and Environment, Institute of Geology and Geophysics, Chinese Academy of Sciences, reported recently that global warming will shift the East Asian monsoon rain belt northward, which was published in *PNAS* (2015, 112: 13178–83).

The East Asian summer monsoon has been decreasing since the 1970s. As a result, the monsoon rain belt migrated southward, with more droughts in northern China countered by more floods in southern China. The trend of decreasing monsoon intensity has been attributed to global warming by many scientists, thus raising great concerns over further drying in northern China as global warming continues. Glacial-interglacial changes in the distribution of  $C_3/C_4$  vegetation on the Chinese Loess Plateau have been related to East Asian summer monsoon intensity and position, and could provide insights into future changes caused by global warming.

By measuring  $^{14}\text{C}$  ages and carbon isotope composition ( $\delta^{13}\text{C}$ ) of soil organic matter for loess-soil deposits at 21 sites, the team reconstructed the spatiotemporal pattern of  $C_4$  vegetation on the Chinese Loess Plateau for the past 20 ka. The spatial pattern of  $C_4$  biomass in both the Last Glacial Maximum (LGM) and the mid-Holocene closely resembles that of modern warm-season precipitation, and thus can serve as a robust analogue for the contemporary East Asian summer monsoon rain belt. The 10%–20% isolines for  $C_4$  biomass in the southeastern part of the Plateau during the LGM moved to the northwestern part during the mid-Holocene, indicating a northwesterly monsoon rain belt advance of  $\sim 300$  km for the warm Holocene compared with the cold LGM. These results suggest that a warming climate shifts the East Asian monsoon rain belt northward, and that the southward displacement of the monsoon rain belt and the drying trend observed during the last few decades in northern China will soon reverse as global warming continues.



**Figure** Migration of the East Asian summer monsoon rain belt (purple dashed lines) from the Last Glacial Maximum (LGM,  $\sim 19$  ka) to the mid-Holocene ( $\sim 4$  ka).