

The climatic effect of the uplift of the Tibetan and Mongolian Plateaus and the Tian Shan orogen to the East Asian monsoon.

Despina Zoura (1), Daniel Hill (1), Aisling Dolan (1), Zihua Tang (2), and Alan Haywood (1)

(1) University of Leeds, School of Earth and Environment, Leeds, United Kingdom (eedz@leeds.ac.uk), (2) Key Laboratory of Cenozoic Geology and Environment, Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100029, China

The climatic effect of the Tibetan Plateau (TP) uplift is a topic particularly interesting for palaeoclimate research and its importance on global and regional scales has been emphasized in many studies. In this study we focus on the impact of the Central Asian orogens uplift (namely the TP, Mongolian Plateau (MP) and Tian Shan (TS) orogen) to the East Asian climate and in particular the East Asian Monsoon (EAM). In contrast to typical monsoonal systems (i.e. the South Asian monsoon) the EAM is extra-tropical in nature with precipitation and winds associated with frontal systems and the westerly jet. The formation of the East Asian Monsoon (EAM) is attributed to land-sea thermal contrast, orographic forcing and the seasonal shift of the westerly jet. Rather than previous modelling studies using bulk uplift simulations only for the TP, here we uplift all major Central Asian orogens over the area between 62.5°E and 125°E at 20°N – 52.5°N, carrying out 7 simulations using different topographical boundary conditions from sea-level up to present-day elevation, and one simulation where Central Asia is set to Oligocene-like elevation.

Our results suggest that EAM precipitation is controlled by low-level winds carrying moisture from South China Sea and the adjacent ocean. The westerly jet is flowing zonally when the TP, MP and TS are set to elevations less than 3000 m but above this threshold the northward jumps of the westerly are similar to the Pre-industrial control and timed with the seasonal rainfall propagation to the north of the EAM region.