

Effect of tectonics on the Asian climate during the Cretaceous.

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Understanding the behaviour of the global climate system during the hot climate of the Cretaceous is essential for understanding the Earth system dynamics. A poleward shift and an equatorward shift in the subtropical high-pressure belt before and after the mid-Cretaceous “supergreenhouse” period, suggested drastic shrinking of the Hadley circulation possibly exceeding a pCO₂ threshold (Hasegawa et al., 2012). However, climate modelling studies have not supported such a planetary wind system (Chen et al., 2013; Farnsworth et al., 2019). Due to a lack of Tibetan Plateau in East Asia, the rainfall decreases with global warming, and it is difficult to explain latitudinal changes in the desert zone (Higuchi et al., 2021). Contrary, the position of the coastal mountains is sensitive to desert distribution, yet it is still a matter of debate about the mismatch between model results and geologic records (Zhang et al., 2021). Here we conducted simulations of the Cretaceous climates with different coastal mountains using an atmosphere-ocean general circulation model, MIROC4m, to investigate the hydrological cycle changes as topographic changes.

The results show that changes in the latitude of the coastal mountain is needed to explain the latitudinal changes in the Late Cretaceous desert zone in East Asia. Changes in the position of the coastal mountains may be related to a latitudinal shift of collision between East Asia and Okhotomorsk Block.

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