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Impact of Himalayas and Tibetan plateau uplift on regional climate and isotopic lapse rate

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The Himalayan-Tibet barrier dominates atmospheric circulation over central Asia and influences global climate. The current high Tibetan Plateau owes gradually during the north-northeastward penetration of the Indian subcontinent into the Eurasian continent and in 2 main stages of abrupt uplift due to break of Neo-Tethyan slab ∼45 Ma and convective removal of Lhasa lithospheric root ∼30-26Ma. Therefore, the northern plateau may have attained its present-day elevation not earlier than ∼13Ma. Nevertheless, several studies based on stable-isotope paleoaltimetry call for paleoelevations at ∼35Ma comparable with present-day. Understanding variation of isotopic lapse rate through the time and with changing of absolute value of elevations is critical to estimate paleoelevations and consequently carry on reliable paleoclimate reconstructions. For the purpose of simulating changes in isotopic composition of precipitation due to uplift of the Himalayas and Tibetan plateau the atmospheric general circulation model LMDZ-iso has been used. This model captures the spatial and temporal patterns of precipitation δ^{18}O and their relationships with moisture transport from the westerlies and Indian monsoon. Three sensitivity experiments with modern and reduced elevations over the Himalayas-Tibet show changes in precipitation rate, precipitation δ^{18}O, as well as moisture sources over India, East-Southern Asia and Himalaya and Tibetan plateau areas. Moreover, our results allow to capture changing in isotopic lapse rate with shifts of mountains height. This result has implications for the region uplift history, because oxygen isotope paleoaltimetry assumes that the modern δ^{18}O lapse rate is representative of times when the mountains were lower.