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Mountain uplift and the strength of the Benguela Current and upwelling system

Gerlinde Jung (1), Matthias Prange (1,2), Michael Schulz (1,2)

(1) Center for Marine Environmental Sciences, University of Bremen, 28334 Bremen, Germany (gjung@marum.de), (2) Faculty of Geosciences, University of Bremen, 28334 Bremen, Germany

The Benguela Current and coastal upwelling system off the West coast of southern Africa have, according to proxy evidence, progressively cooled and intensified during the past 12 million years. Hypotheses on the causes for these long-term changes involve increasing Antarctic glaciation and global cooling, the northward movement of the African continent, and the closing of the Central American seaway.
Here we show that African mountain uplift might have contributed to the cooling and strengthening of the Benguela Current and upwelling system during the late Neogene.
Geological evidence suggests phases of major uplift in the East African Rift system as well as in south and south-west Africa during the Late Miocene and Pliocene.
We performed model experiments with the comprehensive Community Climate System Model Version 3 (CCSM3) to test the effect of regional mountain uplift in Africa on the atmospheric and ocean circulation. The model is run with a resolution of T85 ($\sim$1.4°) for the atmosphere and land surface and a variable resolution for the computation of ocean and sea ice down to a meridional grid spacing of 0.3° around the equator.
The model results indicate a strengthening of the low-level jet along the southwestern African coast inducing increased Ekman pumping and upwelling. Additionally, we find an increased equatorward wind-driven transport of water masses near the south-west African coast. Consequently simulated surface ocean temperature in the Benguela region decreases by up to 3.5°C due to mountain uplift from half to full present-day altitude.