

HSPDP Modeling Projects:

Evaluate hypotheses of hominin evolution/demography based on paleodata and model outputs

Paleodata

From core and outcrop records (e.g. quantitative paleo-temperature and precipitation, exhumation and faulting history, vegetation, archaeological and paleo-anthropological records) we will suggest new geographic and temporal targets for obtaining critical records and needed resolution of those records.

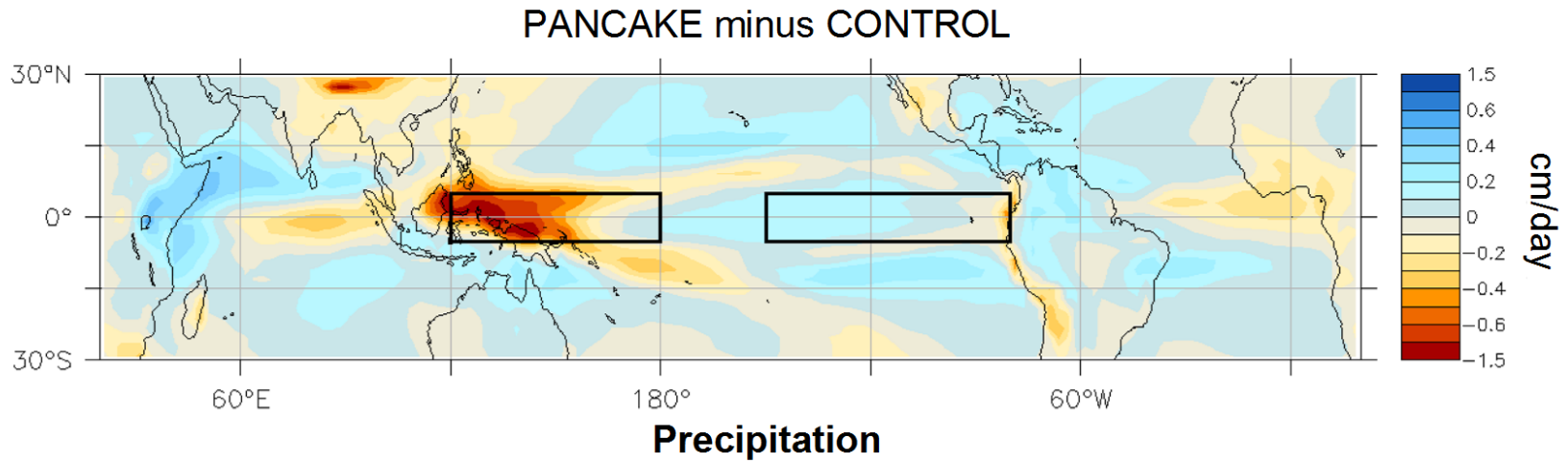
Agent Based Models. Simulations of multiple autonomous agent interactions to evaluate hominin evolution in response to specific environmental parameters (**Kingston**)

Statistical Models. Time series analysis of paleodata, modeled landscape evolution and regional and global climate model simulations. Outputs: test of congruence and climatic/tectonic variability and evolutionary change (**Trauth**).

Landscape Evolution Models. Simulations incorporating paleoclimatic and tectonic constraints (e.g. exhumation rates). Outputs: water resource (lake, spring) extent and availability under variable conditions (**Pelletier + Post-Doc**).

Earth System Model. Tests of Major Climatic/Tectonic/Vegetation Plio-Pleistocene Hypotheses: (Using GFDL-ESM2M, Dunne et al., 2012)

- 1) Closing of Indonesian Throughflow: Shifting of warm pool from Indian to Pacific
- 2) Closing of Panama Seaway: Cooling of Atlantic SSTs and start of NADW production
- 3) Increase in Asian Monsoon: Global cooling increases Land-Sea temperature contrast, changes seasonal position of the ITCZ (**Russell, Stouffer, Shevliakova, Yin**)



Mountains and tropical circulation

Z. Naiman (UA), P. Goodman (UA), J. Krasting (GFDL),
S. Malyshev (Princeton), J. Russell (UA), R. Stouffer (GFDL)

We use two state-of-the-art earth system models to explore the impact of earth's mountains on the Walker circulation. When all land-surface topography is removed, the Walker circulation weakens by 33-59%. There is a ~30% decrease in global upward vertical wind velocities in the middle of the troposphere, but only minor changes in global average convective mass, precipitation, surface and sea-surface temperatures, and the zonally symmetric Hadley circulation.



Out for Review at Nature Geoscience