Future change in precipitation seasonality over the Horn of Africa in high-resolution simulation

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How the precipitation seasonal cycle over HOA will respond to greenhouse warming.
Model (ultra high-resolution simulation)

- The Community Earth System Model (CESM 1.2) has been used; with horizontal resolution of 25 km in the atmosphere and 10 km in the ocean.

Present day run → 2XCO2 run → 4XCO2 run

Please attend Prof Axel Timmermann's talk for detail information about ultra high-resolution simulation on Thu (07 May) 08:30–10:15 | D3034 |

Mean state and variance

\[ cv = \frac{\sigma}{\mu} \times 100 \]
Bimodal amplitude (GPCP)

White contours represent topography greater than 1Km.
Seasonality amplitude ratio has been reduced over East Africa.
Seasonal precipitation

Almost doubled short rains under quadruple CO$_2$
Precipitation response to CO$_2$
Moisture transport change

MFC-Shaded, MT-vectors
Changes

$\Delta MFC = -\nabla \cdot (\Delta \tilde{V} \tilde{q}) - \nabla \cdot (\Delta q \tilde{V})$

$\Delta MFC = \text{dyn} + \text{Thermo}$
Conclusions

✓ Precise representation of precipitation seasonal cycle over HOA adds confidence for future projected changes in seasonality.

✓ Seasonality amplitude ratio has been shifted over East Africa under greenhouse warming

✓ Future greenhouse warming leads to the intensified seasonal cycle of precipitation with a projected increase in the short rain season