

Weather Clim. Dynam. Discuss., author comment AC1
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Reply on RC1

Nele Tim et al.

Author comment on "The impact of the Agulhas Current system on precipitation in southern Africa in regional climate simulations covering the recent past and future" by Nele Tim et al., Weather Clim. Dynam. Discuss.,
<https://doi.org/10.5194/wcd-2022-47-AC1>, 2022

We thank the reviewer for its constructive comment. In the following, we list the comments (in italics) and reply to them (in normal font).

We will add the suggested references:

2015, Passive suppression of South African rainfall by the Agulhas Current, Earth Interactions, 19, 1-14

2019, South Africa's future climate: trends and projections, in The Geography of South Africa, eds. J. Knight and C.M. Rogerson, Springer Nature, Switzerland, 305-313.

2020, Marine climate change over the eastern Agulhas Bank of South Africa, Ocean Science, 16, 1529-1544.

in Fig 4a, 5a the observed GPCP rain trend is given 1997-2018, this period is too short. With trends over the sea masked, why not use the Chirps2 or ERA5 rainfall trend? these cover a longer time period

As CHIRPS covers a relative short period too (1981 onwards), we would add ERA5 (like suggested by the reviewer) and additionally GPCP (available 1891 onwards) and CRU (available 1901-2020) for the validation purposes.

in Fig 7a the (Hadley) observed SST trend should be compared with model trend

We will add the observed trend to the figure.

in Fig 8a there is a SST warming in the Angola Dome in the tropical E. Atlantic which is said to be related to the Agulhas leakage, however this zone is where most models fail to correctly simulate the shift of anticyclonic winds and tropical rainfall. Thus changes in SST due to Agulhas leakage could be linked to a poleward shift in the subtropical ridge? or inability of model to reflect the teleconnections? A useful reference on this subject: 2013, Climate trends in southern Africa, S. Afr. J. Science, 109, 53-63 - although using CMIP3 their Fig 1 shows the model bias that continues (with lesser values) in CMIP6.

In our interpretation the reviewer is suggesting that the deficiency of coarse resolution

global models to replicate the shift of the anticyclone and tropical rain band could be due to the unrepresented effect of the Agulhas leakage in those models. This is an interesting hypothesis. We will try to investigate a but further to what extent the variations of the Agulhas leakage impacts rainfall in the Eastern Tropical Atlantic. Usually, the bias of coarse resolution global climate models in the EBUS, in particular SSTs, has been attributed to an incorrect cloud parametrization or to poorly resolved upwelling dynamics (see e.g doi: 10.1002/wcc.338), but the role of the Agulhas system is an interesting alternative, at least in the Benguela EBUS. We will discuss this in view of the suggested reference. Essentially, we will expand the analysis presented in Figure 9 to ocean precipitation.

in Fig 9c,e, 10c,e the color bars are reversed, which may correctly be interpreted, but the caption needs to provide a note on this.

We will indicate the reversed colour bars in the figure caption.