

## Corrections to the article

*“Statistical downscaling of rainfall changes in Hawai‘i based on the CMIP5 global model projections”* published (online) in JGR-Atmospheres 12 JAN 2015

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Introduction: In the article of Elison Timm et al. (2015) we present a method to statistically downscale seasonal mean rainfall changes from large-scale circulation patterns simulated by the CMIP5 models for the RCP 4.5 and RCP 8.5 scenarios. While working on sensitivity studies of the regional statistical downscaling we discovered previously unnoticed errors in the computer scripts that generated the downscaled rainfall change pattern. Here we provide a corrected version of the figures, a review of the differences between the erroneous old results and the new corrected results. The coding errors led to a mistake while reading and writing unformatted binary output during the dry season downscaling process. As a consequence the final maps and area average statistics presented in the article in 2015 are incorrect for the dry season (exception is the island of Oahu where old and new results are identical, because the coding error did not affect the data from O‘ahu). Here we present the updated maps and calculated island-statistics and discuss the new dry season results by comparing them with the original results. Since the primary focus of our downscaling article was on the wet season, most sections of the article remain valid and need no further correction.

New rainfall projections for the dry season:

The corrected dry season results show a pronounced drying trend over the arid and semi-arid areas concentrated along the leeward sides of Maui and O‘ahu. A large section of the island of Hawai‘i is projected to experience drier conditions in future, including the high elevation regions and parts of the climatically driest regions in the western parts of the island. Further, parts of the wet forested regions in the southeast sector are expected to experience a drying trend during the coming decades according to the statistical results. Neutral precipitation anomalies are found over the eastern mountain sections of Maui and Hawai‘i Islands. The northeast facing mountain slopes on Hawai‘i Island show a narrow band with slightly enhanced rainfall. Over the medium elevations of the Ko‘olau mountains on O‘ahu, no significant changes are expected by the middle of the 21<sup>st</sup> century. It should be noted that Kaua‘i shows a weak response in future warming scenarios, small in amplitude and not statistically significant. Only a small region on the western side is projected to experience drier conditions in future.

We note that the linear regression results for the late 21<sup>st</sup> century result in unrealistically large negative rainfall anomalies in some areas, especially under the RCP8.5 scenario. Clearly, the linear regression method becomes less reliable in predicting the amplitudes as the anomalies become larger. The pattern with positive and negative signs as well as the location of the strongest and weakest anomalies, however, remain stable under the more severe warming scenarios. Together with the low cross-validation skill of the downscaling model during the dry season, we consider these maps as a guidance where one could expect strongest negative anomalies and where neutral or slightly wetter conditions can be expected. The absolute magnitude of the changes remains uncertain and linear regression method tends to overestimate the amplitude of the negative anomalies.

Summary for the dry season:

The corrected dry-season rainfall anomalies are physically more consistent across the islands and reflect the fact that areas with trade-wind dominated rainfall regime along northeast facing mountain ranges of Maui and Hawai'i Islands remain nearly constant under future climate change. The strongest drying trends are projected for the leeward sides and high elevation regions on Hawaii. This spatial pattern suggests that moisture advection with the trade winds will be stable in future and compensate for the general rainfall reduction expected with a more stable atmosphere in connection with a widening of the Hadley Cell subsidence region.

Figure C1:

Correction to Figure 13 (c):

Dry season rainfall anomalies for the RCP4.5 2041-2071 ensemble median. Colors show anomalies in percent of the present-day climatological mean values.

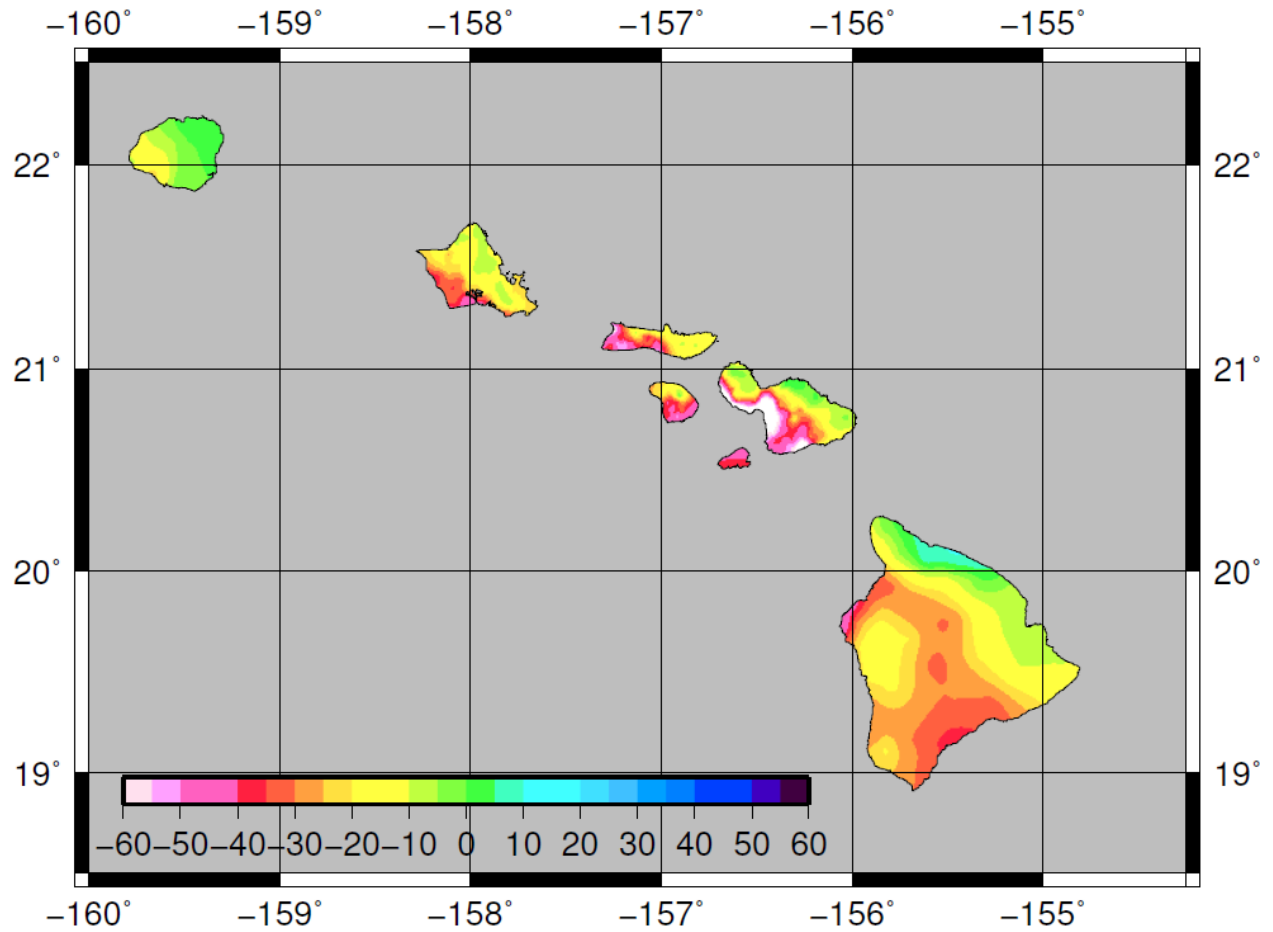


Figure C2:

Correction to Figure 13 (d):

Dry season rainfall anomalies for the RCP 8.5 2041-2071 ensemble median. Colors show anomalies in percent of the present-day climatological mean values.

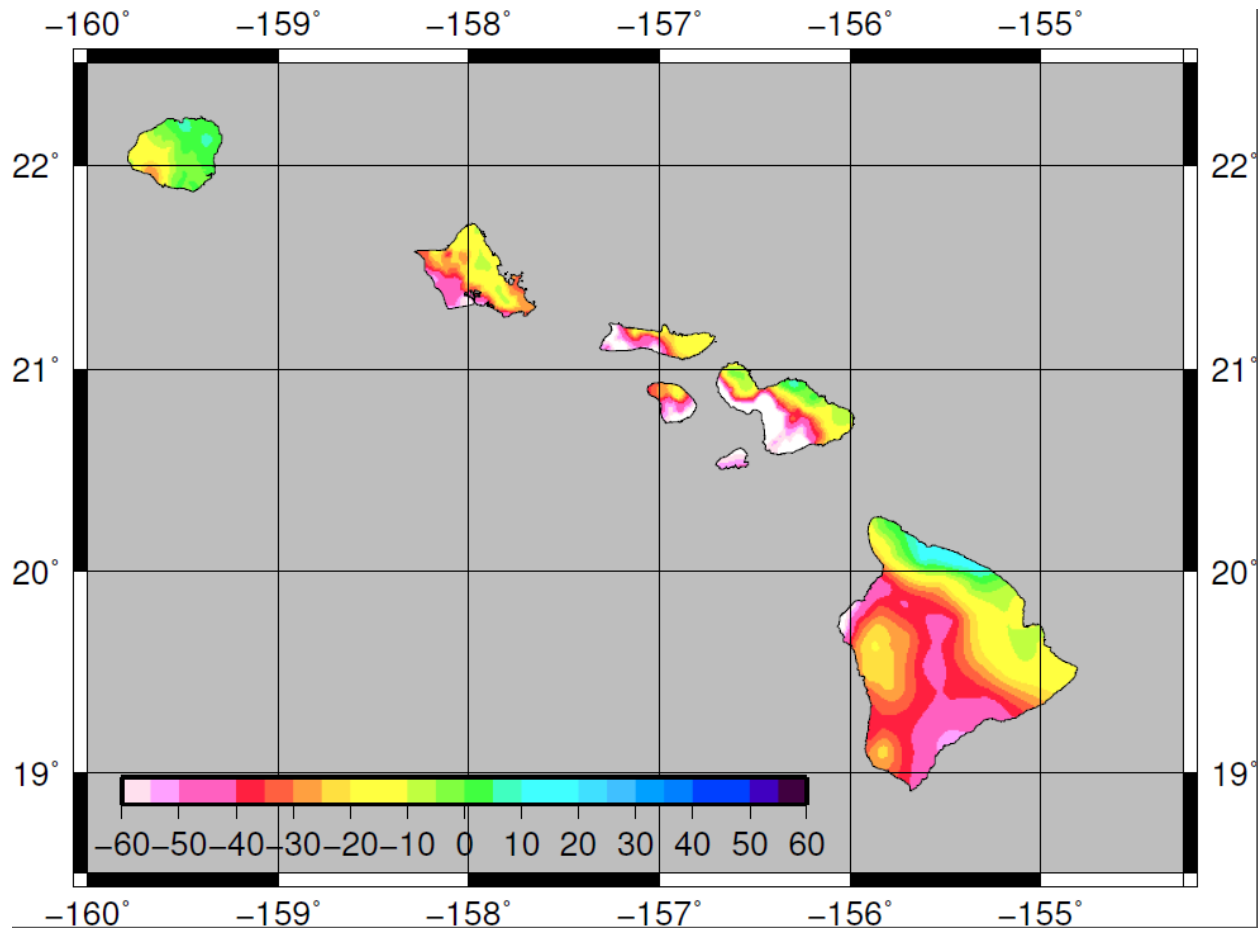


Figure C3:

Correction to Figure 14 bottom left graph:

Area-averaged precipitation changes expressed in percent of the island-average seasonal rainfall climatology from the Rainfall Atlas of Hawai'i [Giambelluca et al., 2013]. Note that for that purpose, we first converted the local percentage anomalies into absolute anomalies (in units of inches). The largest difference between the old and new values are observed for the island group Maui Nui, where area average suggest now up to -25% rainfall anomalies during the dry season in RCP 8.5 in the period 2071-2099. Previously, the estimate was as low as -45%.

Bottom left Figure:

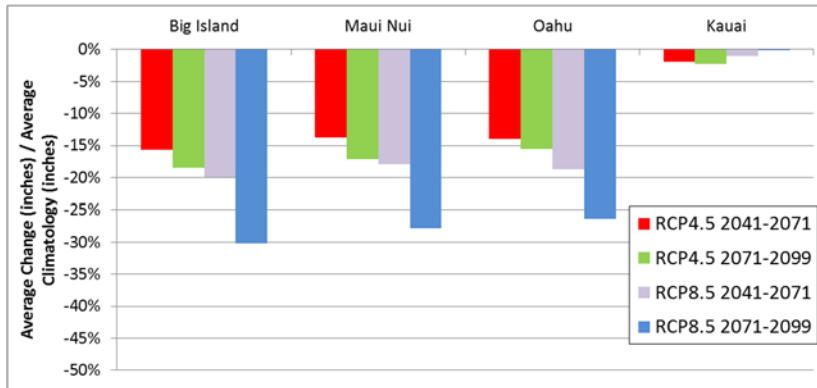
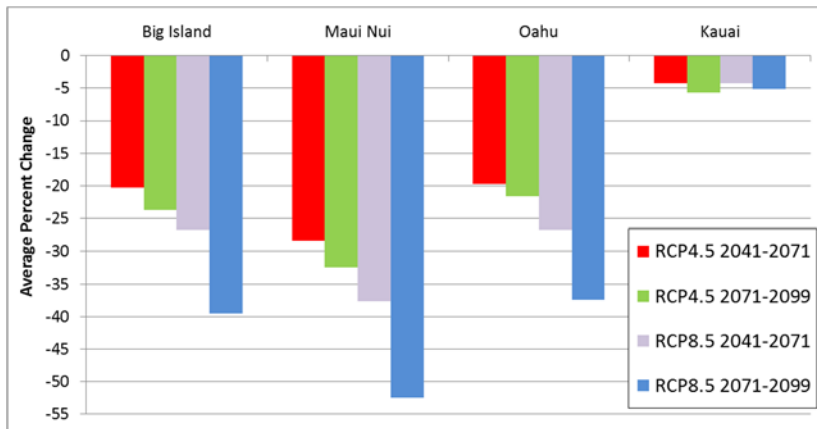


Figure C4:

Correction to Figure 14 bottom right graph:

Percentage changes averaged over the islands for the dry season (using interpolated maps). The largest difference between the old and new values are observed for the island group Maui Nui. The direct area average of the percentage anomalies has become more negative (about -50% for RCP 8.5 years 2071-2099, compare with the old value -45%). Also the Big Island shows larger reduction in the average rainfall anomalies about -30% for RCP 8.5 years 2071-2099 (compared with the old value -25%).



Data sets are made available at:

Asia-Pacific Data-Research Center (APDRC) <http://apdrc.soest.hawaii.edu/projects/SD/>

USGS National Climate Change and Wildlife Science Center (NCCWSC) data server (under the project title “Climate Change Research in Support of Hawaiian Ecosystem Management: An Integrated Approach”)

<https://nccwsc.usgs.gov/display-project/4f8c650ae4b0546c0c397b48/50118bd1e4b0d78fd4e59ba1>

or at the authors home page at

[http://www.atmos.albany.edu/facstaff/timm/products\\_data.html](http://www.atmos.albany.edu/facstaff/timm/products_data.html)

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