Corrigendum

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ABSTRACT: We correct an error relating to the comparison of precipitation variability in coupled models versus models run with prescribed SSTs ("AMIP models") and discuss what conclusions to draw from the corrected result.

We have become aware of a computational error in Strommen et al. (2025, hereafter S25) regarding the difference in Gulf Stream precipitation variability between coupled models and AMIP models, i.e., models run with prescribed sea surface temperatures (SSTs) and sea ice. Concretely, the result shown in Fig. 8a of S25 is incorrect. We now explain this error and discuss the consequences for the conclusions we drew.

Previous studies have used a comparison between AMIP and coupled models to argue for the primary role of oceanic (as opposed to atmospheric) horizontal resolution in driving a model's blocking behavior (Athanasiadis et al. 2022; Mathews et al. 2024). In section 5c of S25, we argued that this approach is ill-founded because the daily precipitation variability is systematically different between AMIP and coupled models due to the excess thermal damping taking place in AMIP models. Our argument was supported by Fig. 8a from S25, which compared the daily Gulf Stream precipitation extremes in the HighResMIP coupled models against those of their exact AMIP counterparts and found that the AMIP models apparently had substantially reduced extremes compared to the coupled models. However, the result of Fig. 8a in S25 was wrong because the extremes for the AMIP models were accidentally computed over a wider North Atlantic domain, which includes the Gulf Stream but also covers the broader basin. The corrected result is shown in the present Fig. 8a, demonstrating that there is, in fact, no meaningful difference between AMIP and coupled models once the correct domain is used.

In S25, we used the results of Barsugli and Battisti (1998, hereafter BB98) to add weight to our argument. BB98 describes how AMIP models experience excessive thermal damping due to the lack of coupling. However, as emphasized in BB98, this phenomenon primarily affects the low-frequency two-meter temperature (T2M) variability: It was purely our own erroneous computation that led us to believe that the effect was already visible on daily time scales for our particular case. Figure 8b shows the standard deviation of daily Gulf Stream T2M after applying an n-day running mean for different values of n, averaged across all the HighResMIP models. It can be seen that a discrepancy between AMIP and coupled models only emerges when $n > 7$ or so. As an example, in Figs. 8c and 8d, we show the distribution of standard deviations for $n = 1$ and $n = 60$, respectively. Consistent with Fig. 8b, there is also no visible impact of the thermal damping effect on daily time-scale precipitation variability in the Gulf Stream.

There are two key points of the discussion in S25 affected by this mistake.

1) In S25, we argued that comparing AMIP and coupled models is complicated by the different precipitation variability. Instead, our results now indicate that comparing blocking biases in AMIP and coupled models is, as far as we can tell, a reasonable thing to do. The observation in

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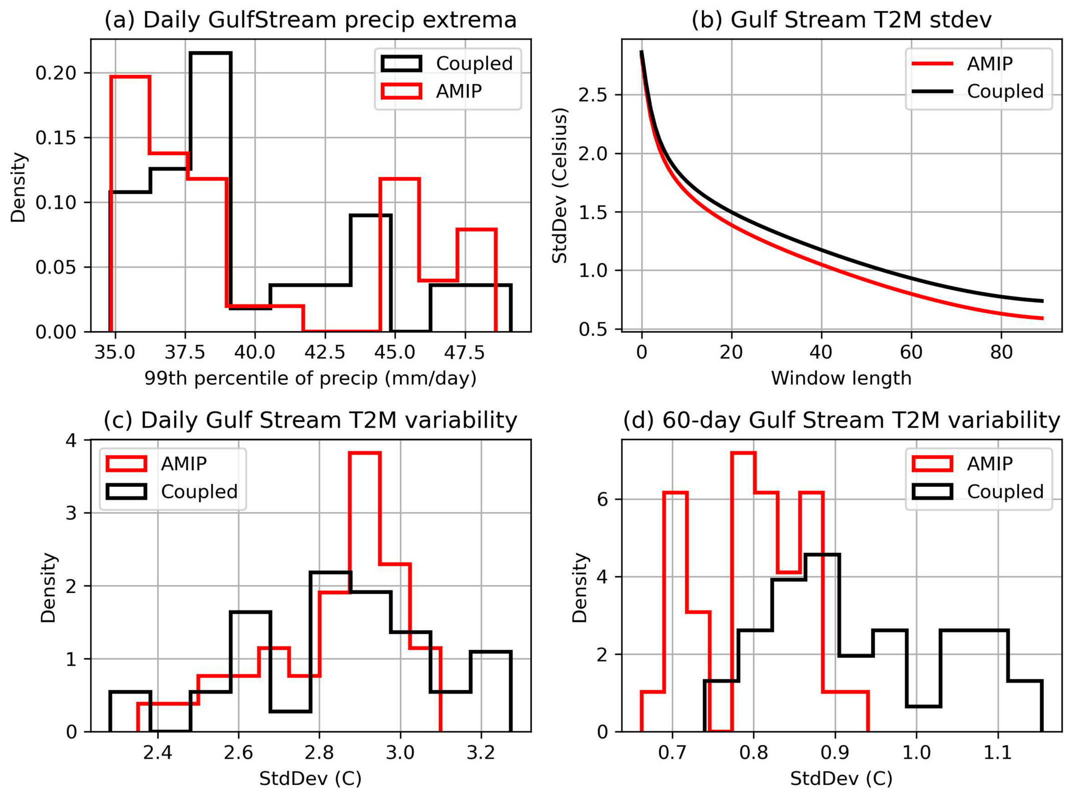

FIG. 8. (a) Histograms of Gulf Stream precipitation extremes in coupled (black) and AMIP (red) HighResMIP models. (b) Standard deviation of T2M averaged over the Gulf Stream region after taking an *n*-day running mean. The black (red) line is the mean across all coupled (AMIP) HighResMIP models. (c) Histograms of daily Gulf Stream T2M averaged over the Gulf Stream region for coupled (black) and AMIP (red) HighResMIP models. (d) As in (c), but with a 60-day running mean.

Athanasiadis et al. (2022) that increased resolution is associated with a greater bias reduction in European blocking frequencies in the HighResMIP coupled models compared to their counterpart AMIP models could, therefore, potentially reflect the importance of ocean resolution. However, as mentioned in section 5c, it could also just reflect that in coupled models, the resolution tends to increase in both atmosphere and ocean, while in AMIP models, the resolution only increases in the atmosphere. Sampling variability could also affect the result, as discussed in section 5b. It should also be kept in mind that other studies have independently argued for the importance of coupling for blocking episodes (Mathews and Czaja 2024), meaning some of the difference could reflect this effect.

2) In S25, we suggested that the fact that AMIP models have broadly similar blocking biases to coupled models is because they exaggerate the influence of SSTs and underestimate the importance of precipitation extremes due to the “excess thermal damping” effect. Instead, we now interpret the similar biases in AMIP and coupled models as being consistent with our hypothesis of the importance of Gulf Stream precipitation and the relative unimportance of SST biases. That is, because AMIP models have similar precipitation extremes as coupled models (Fig. 8a), they also have similar blocking biases, and removing the SST biases does not significantly reduce the bias further because the role of SST biases is small or negligible across models as a whole. In particular, the ability to simulate precipitation extremes accurately is primarily a function of the atmospheric resolution and convection parameterization, not the oceanic resolution.

We emphasize that all the other conclusions of S25 are unaffected by our error, since the error was restricted to computations using the AMIP models, and these were only used in Fig. 8. In other words, it is still true that European blocking frequencies are strongly correlated with Gulf Stream precipitation extremes (and overall variability) in coupled models, and that the enhanced blocking frequencies observed when increasing model resolution are consistent with enhanced precipitation extremes in higher-resolution models. It is also still true that the links between SST metrics and blocking frequencies/northward jet shifts are weak or nonexistent in our ensemble. Finally, the composite analysis supporting our discussion on mechanisms is unaffected.

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