The greatest improvements are seen in $u$ and $|U_h|$, as was seen in the profiles with the better depiction of the jet. Some bias degradation is seen in these means for $v$ and $q$. However, we also emphasize that these results are not overly meaningful since the mean biases for both these variables are small to begin with and therefore the absolute changes in biases between model configurations are small as well (even if the ratio that governs the shaded underlay is large).

Biases cannot paint a full picture, since they do not account for errors that have no mean tendency. Figure 13, is identical to Fig. 12 except it describes root mean squared errors (RMSEs) rather than biases (and has a much more sensitive color scale that runs from a 15% decrease to a 15% increase). Predictions of $u$ are indeed improved when measured by aggregate RMSE reduction (albeit by a few percent) in PM-O. Although mean $u$ bias between 200 m and 2 km is reduced in PM-O relative to ED-O, recall that the improvement in the structure of the wind profile seen when moving from ED-O to PM-O is accompanied by an increase in the strength of the easterly jet, which itself has an easterly bias in ED-O (see Fig. 2). The worsened $u$ biases at certain altitudes in PM-O likely counteract any improvements in layer-mean RMSEs that may come from a more accurate wind profile structure. Improvements in thermodynamic fields are also visible as reductions in RMSEs. This is particularly interesting for PM-O relative to ED-O since the code used to calculate the turbulent fluxes of scalars ($T$ and $Q$) was the same in these runs. Such improvements again suggest downstream effects of better resolving momentum profile structure via feedback with mean state fields: a phenomenon not seen in single-column models.

The ED-X simulations include larger reductions in RMSE for $T$ and the closely related $\theta$ – ranging between 10 and 20 percent – although larger degradations in the wind profiles when compared to PM-O. These apparent temperature improvements are likely dominated by the reduction of the cold bias seen at almost all altitudes when moving from ED-O to ED-X. A correspondence of those altitudes with the greatest cold bias reduction to those altitudes with the greatest RMSE reduction can be seen in Fig. 6. Combining the two updates (PM-X) results in RMSE improvements for each variable when compared to ED-O, implying that a combination of the prognostic momentum and the experimental length scale improves the simulation fidelity. This provides further evidence for both of these modifications to jointly improve boundary layer structure and for