General comment

In this manuscript, the authors design an architecture for CBM-Z chemical mechanism on next generation processors. This is interesting and quite useful for the routine numerical air quality forecast. I believe that this acceleration is helpful to policy managers. The acceleration of chemical solver is a difficult problem since 1980s. The computer technique has a rapid development. However, air quality models do not fully utilize this development. The contribution is generally well-written and complete. I suggested this manuscript to be published after considering the following comments.

Response: The authors thank for your time and your encourage for this manuscript. As the reviewer mentioned, the hardware of computer has developed and improved, but the air quality model has not fully taken advantage of it to improve its computation efficiency, which may limit its practical value. This work is a part of the project about improving the computation performance of Global Nested Air Quality Prediction Model System (GNAQPMS) (Chen et al., 2015;Wang et al., 2017) and exploring the potential of the Intel Many Integrated Core (MIC) Architecture Chips on air quality model. We hope this work could be a good example to help other users to improve the calculation efficiency of their models on the new generation chips. The detailed responses to the specificcomments are given point to point as following.

Specific Comments

1. In figure 4, The authors plot the intercomparison of SO2. O3, H2O2, NO, H2SO4 between base and optimized simulations. I suggested some short-lived species like OH, HO2, RO2 should be compared, because these species is more sensitive to the mechinism, and very important to atmospheric oxdiation.

Response: The authors appreciate your constructive comments. We fully agree with your suggestion and will add the comparison of short-lived species like OH, HO2, RO2 in the revised manuscript to further verify the model results.

2. The scenario in this manuscript is urban/polluted conditions. The authors present comparisons in other scenario like marine, biomass burning.

Response: The authors appreciate your important comments and accept your advice. Our following work is to conduct more experiments to test the efficiency as well as the validity of the new codes, including the scenario mentioned by the reviewer. We will present corresponding results in the revised manuscript.

Reference

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Wang, H., Chen, H., Wu, Q., Lin, J., Chen, X., Xie, X., Wang, R., Tang, X., and Wang, Z.: GNAQPMS v1.1: accelerating the Global Nested Air Quality Prediction Modeling System (GNAQPMS) on Intel Xeon Phi processors, Geosci. Model Dev., 10, 2891-2904, 10.5194/gmd-10-2891-2017, 2017.