Review of the proposal entitled “Model Forecast Post-processing of Ozone and PM2.5” with ID of 2777632 by James Wilczak (Co-PI), Irina Djalalova (Co-PI), Stefano Alessandrini (Co-I), Dave Allured, and Laura Bianco (Co-Is)

General comments: The Co-PIs have successfully provided a bias correction technique called Kalman Filter Analog Ensemble (KFAN) to improve operational predictions of surface O3 and PM25 at NOAA NCEP with National Air Quality Forecasting Capability (NAQFC). A prominent issue is that the current KFAN bias correction failed to correct the significant under-predictions of PM2.5 during heavy wildfire events. In this project, the applicants will develop and test two new methods to enhance the KFAN for improving NAQFC predictions of PM2,5­ and O3 for high concentration air quality events such as heavy wildfire events. Furthermore, they will test the KFAN with FV3-driven CMAQ predictions and extend the bias correction forecast hours from 48 hours to 72 hours. Overall the project has clearly identified several urgent issues including bias correction for extreme cases, FV3 development, extension of 72 forecast hours, and KFAN code optimization that the NAQFC currently faces. I would suggest this project to be funded.

Specific comments for each scoring item are provided below.

1. Importance/Relevance and Applicability of Proposed Project to Program Goals: 27 points

Comments: In this project, the applicants clearly identify several urgent issues that the NOAA National Air Quality Forecasting Capability (NAQFC) currently faces. The issues include failure in correcting significant under-predictions by the KFAN bias correction method for extreme events such as heavy wildfire events, FV3 transition, extension of 72 forecast hours, and KFAN bias correction code optimization. The Co-PIs have a successful experience collaborating with NCEP/EMC to test and implement the KFAN bias correction for improving NAQFC O3 and PM2,5 predictions over the past several years. I believe that the bias-corrected PM2.5 and O3 predictions will be further improved especially for those heavy wildfire events if the propose is funded.

1. Technical/Scientific Merits: 28 points

The CO-PIs know the KFAN which has been implemented in the NAQFC and its limitation pretty well. The proposed methods sound technically correct and are expected to work more effectively on improving the bias correction results for the extreme cases such as heavy wildfire events. I believe that the KFAN performance will be improved if higher weights are assigned to the predicted chemical species (i.e., O3 and PM2.5) and spatial variability and seasonal impact are included for analog search. But I am not sure the 2nd method will perform as propose expects since the number of extreme events is limited. Perhaps the continuity property of event on the previous day should be included for analog search in order to capture observation more realistically on current day during multi-day wildfire events. It is important to extend the KFAN bias correction forecast hours from 48 to 72 hours, optimize the bias correction source codes as well as test the feasibility of KFAN in support of transition of the NAQFC to the FV3 driven air quality forecasting system.

The proposal identifies necessary metrics for evaluating the performance of the refined bias correction approach and provides a clear schedule for deliverables and advances the NOAA Readiness Level (RL) from 5 to 8 to support the transition of operational implementation. It has a good Data Management Plan as required by the program.

1. Overall Quantifications of Application: 17 points

All the applicants have necessary education, experience, facilities, and resources to complete the project. They have demonstrated an ability to conduct successful research and support R2O transition work

1. Project Costs: 9 points

The requested costs are realistic, reasonable, allowable, and commensurate with the project benefits, deliverable, and time period. The applicants have proposed cost-effective ways of accomplishing the project.

1. Outreach and Education: 4 points

The applicants have a feasible plan to share the data, present the results at the AMS and AGU, and submit a manuscript for peer-reviewed publication. The proposal does not promote the education and field experience of undergraduate and graduate students. No opportunities are developed in this proposal to share with K-12 educators.