

Interactive comment on “Development of 3D Variational Assimilation System Based on GRAPES-CUACE Adjoint Model (GRAPES-CUACE-3D-Var V1.0) and Its Application in Emission Inversion” by Chao Wang et al.

Anonymous Referee #1

Received and published: 23 February 2020

The authors developed the GRAPES-CUACE three dimensional variational assimilation system (GRAPES-CUACE-3D-Var) based on the GRAPES-CUACE aerosol adjoint model by using the optimization algorithm and pollutants observations. It performed well in the inversion of BC emissions in Beijing-Tianjin-Hebei region. However, I still recommend this manuscript be revised before publication. Firstly, the inherent flaws in the transport model and emission inventory could produce the uncertainties in the results, please add some discussion. Secondly, the simulations were performed in wintertime, the stagnant conditions and temperature inversion are often difficult to reflect

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the reality. But almost all the pollutants reached a high level. How the author address the question? Some minor corrections are also needed listed in following. 1. “3D” in the title “Development of 3D Variational Assimilation System Based on GRAPES-CUACE Adjoint Model (GRAPES-CUACE-3D-Var V1.0) and Its Application in Emission Inversion” is better replaced with the full name “three dimensional”. 2. Page2, line49, “Foreign scholars” is inappropriate. It is recommended to change it to “Many scholars ”. 3. Page3, line64, “the accompanying model” should be “the adjoint model” ? 4. Page3, line83, “cuace” should be “CUACE” ? 5. Page3, line85, “Chen” should be “Chen et al.”? 6. Page5, line137, “ground state value” should be “basic-state value”? There are some other similar words. 7. Page5, line138, “variable s” should be “variables”? 8. Page5, line153, “priori source” should be “a priori source” ? “posterior source” should be “a posterior source”? There are some other similar words. 9. Page6, line185, “i.e.” should be “then” ? 10. Page7, line190, “is in the central” should be “is the central” ? 11. Page7, line195, “the start-up” should be “spin-up”? 12. Page7, line211, “the inverse evolution quantity” should be “inversion variables”? 13. Page11, line316, “(LIMITED-MEMORY BFGS QUASI-NEWTON METHOD)” is not necessary.

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-313>, 2020.

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