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Journal of Atmospheric and Oceanic Technology

Response to the Reviewer # 1

Dear Reviewer #1,

Thank you for prompt reviewing of this manuscript.

We hired Ms. Mary Golden (was chief editorial assistant of MWR) to help to improve the manuscript.

I changed the title a little bit from “Development of the Upgraded Tangent Linear and Adjoint of the Weather Research and Forecasting (WRF) Modeling System” to “Development of the Upgraded Tangent Linear and Adjoint of the Weather Research and Forecasting (WRF) Model” as this manuscript focus on WRF model, instead of the WRF modeling system, which includes WPS, REAL, WRF, WRFDA etc.

Best Regards,

Xin Zhang

Below is the point –by-point response:

*Reviewer #1: The authors present an interesting introduction of their recent work on the WRFPLUS that include the upgraded tangent linear and adjoint models of WRF's new dynamic core. I am impressed by the innovative technique for parallelizations of tangent linear and adjoint models proposed in this paper. I do believe it is worth accepting this paper for publication on Journal of Atmospheric and Oceanic Technology.*

*However, before it is accepted for publication on this journal, some revisions are required. The detail comments are as follows:*

*1) To show the significance of the new techniqe for parallelizations of tangent linear and adjoint models, the authors should give a description in the section of introduction on how the previous works did to parallelize tangent linear and adjoint models when forward model were upgraded and what difficults were met. Actually, for development of 4DVar system, one of challenging works is to update and parallelize tangent linear and adjoint models following the upgrade of the corresponding forward models. The authors didnot point out this to highlight their innovative work.*

Authors: We add a few sentences to emphasize the difficulty of the parallelization of the WAMS. Please see line 48-51,56-58 page 2-3. We hesitate to emphasize more as we would like to respect the colleagues who worked on WAMS .

*2)The writting should be further improved. Some expressions are not very good logically or not exact in science. The following are some examples:*

Authors: We hired a professional editor (Mary Golden, was chief editorial assistant of MWR) to improve the writing.

*2.1 Line 122 on Page 6: The phrase "general atmospheric model" or "general oceanic model" is scarcely used. In general, it should be "atmospheric general circulation model (AGCM)" or "oceanic general circulation model (OGCM)". In this paper, AGCM or/and OGCM were not considered. Therefore, the phrase "general atmospheric and oceanic models" in this manuscript should be replaced by "atmospheric and oceanic models".*

Authors: The phrases of “general atmospheric model” and “general oceanic model” were corrected to “atmospheric and oceanic models” , see line 132 page 6.

*2.2 Line 123 on Page 6: The phrase "finite differential algorithms" is incorrect, which should be "finite difference algorithms". In mathematics, "differential" is quite different from "difference". They are in continuous space and discrete space, respectively.*

Authors: The phrases of “finite differential algorithms” was corrected to “finite difference algorithms” , see line 133 page 6.

*2.3 Line 161-162 on Page 8: 'Followed by calling "RSL\_LITE\_EXCH\_Y" to finished the packed ghost area data exchanges on south-north direction'. What's meaning of this sentence? Is "to finished ..." correct?*

Authors: To make it more readable, this sentence is modified to “Therefore, one call of ”RSL\_LITE\_EXCH\_Y” is able to complete the data exchanges in the south-north direction ” , see line 171-173 page 8.

*2.4 Line 206-207 on Page 11: What's meaning of "a 15-km domain"? Do the authors mean "a 15km-resolution domain"? What are the range and location of the domain?*

Authors: Add more description of the domain configuration at line 220-222, page 11.

*3) Some improper or incorrect uses, such as:*

*3.1 Line 95-96 on Page 4: A bracket was missing before "Vukicevic (1991)".*

Authors: Bracket was added, see line 105 page 5.

*3.2 Line 136 on Page 6: ".... needs to be revised. the adjoint ...". The first letter of a word after the full stop mark should be capital.*

Authors: Corrected as “…needs to be reversed. The adjoint…”, see line 140 page 6.

*3.3 Line 137 on page 6: "add on". Should it be "add to"?*

Authors: Corrected as “add to”, see line 148 page 6.

*3.4 Line 169 on Page 8: "let Registry to generate ...". Should it be "let Registry generate ..."?*

Authors: corrected as “….there is the possibility of letting the Registry generate “, see line 180 page 8.

*4) Line 252 on Page 12: What coupler was used to couple WRFDA and WRFPLUS? This coupler has never been mentioned in the previous texts. Please give an introduction of it.*

Authors: The use of “coupler” mis-leads the readers. It is not a real coupler and it should be “coupling interfaces”, which are the inline codes/subroutines were developed for couple WRFDA and WRFPLUS together.

We make some correction. See line 265-268 page 13