

Introduction

#1. The introduction part is missing the literature survey on dust simulations using WRF model. The authors should provide a detail on how WRF model has been used for dust simulation in the past (please provide a brief description on the state-of-the-art on the use of WRF model for dust simulation (in Tibetan plateau or elsewhere)) and what new has been done in this manuscript.

#2: Line 65: “from the northern part of the plateau to the plateau”. What does the authors mean here? Please explain.

#3: Line 82: “there are a few studies on dust inner the plateau”. May be this sentence needs restructuring.

Study region and Data

#4: Line 114: “Therefore, we divided the study area into three regions according to climatic characteristics (Figure 1)“. The previous lines have references Zheng, 1996; Xu et al., 2013. Which one of these does the authors have used for “climatic characteristic”. If some other reference is used, then please mention here.

#5: The methodology used to perform the WRF simulations has not been explained well in this manuscript. The authors provide a brief description of the schemes that they have used in Section 2.2.1 But they have not provided any details on the on-line coupling of the WRF-Chem model as they mention in line 123. The authors are suggested to provide a detail on the simulations performed and how the on-line coupling of meteorology and chemistry is performed. Also, the authors should provide details on how the simulations are performed for the three different regions mentioned in Section 2.1. Are they performed independent of each other or through nested domains?? If the simulations are performed independently for each domain, then the authors should provide a reasoning for this i.e., if the boundary conditions will be accurately represented for each domain. If nested domains are used, then the authors should provide details of these simulations.

Model evaluation:

#6: Line 170: “three regional models”. What does the author mean by “three regional models”?? The authors are only using WRF-Chem model in this manuscript. May be the authors are referring

to the three regions of the model. If not, then provide an explanation here. Please rephrase this sentence to avoid confusion.

#6: Line 175: “The model results were slightly lower than the reanalysis results.”. This means that the model is underpredicting these values as compared to the reanalysis values. Can the authors provide a probable reason for this underprediction??

#8: Line 179: “The model results and reanalysis data showed a significant difference in wind speed in summer, with the model results being significantly lower than the reanalysis data, with a difference of 1 m/s”. Can the authors provide an explanation for this finding?

#9: Figure 3: There is something wrong with the legend of this figure. What does the dashed line and the solid lines represent?? The legend only has description of solid lines.

Results:

#10: Line 248: “maximum dust emission in January”. Can authors explain the reason why the dust emission was maximum in a winter month of January and it was lower in summer months, in fact minimum in summer month of August. Why is the emission maximum in Winter and not in summer?? If the frequency of dust storms are more in winter months, then is it possible that the maximum dust emission values are arising due to the frequency, but is it possible that the dust emissions are more in summers but when averaged for the month, then the values comes out to be less?? If so, then has the authors take the frequency of these events into account?? Also, these emission are at what level (at the surface or the averaged values over the 40 vertical layers used in the simulation)??

In line 252, the authors mention “This annual trend was consistent with the observed annual trend in dust storm frequency”. But has the frequency of occurrence of these events taken into account and considered while averaging the emissions for a month?

#11: Line 263: “Wu (Wu et al., 2019) used multiple models to simulate the annual variation in the multiyear average optical thickness of dust over the plateau; they also showed a similar bimodal structure.”. In this work by Wu et. al., authors have presented that for TP, the dust emission is more in March-April than in January. While in this (current manuscript) work, the authors have presented

that the emissions are maximum in January and then decreases to a minimum in August. Can the authors support this claim??? Also, which bimodal structure are the authors talking about??? Please explain this.

#12: Figure 7: I assume that the solid lines represent the model simulation in figure 3, then in North region the simulated temperature is higher from April to September, while wind speed remains mostly constant. Figure 6 shows that the dust emission is low in these months. Can the authors explain why the dust loading in North region is quite high from April to September (Figure 7).

#13: Figure 8: How is the explanation provided for Figure 8 related to Figure 7? It would be nice if the authors can link these two figure alongwith a proper explanation.