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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Inclusion of biomass burning in WRF-Chem: impact of wildfires on weather forecasts" *by* G. Grell et al.

Anonymous Referee #1

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General :

A wildfire algorithm was added to the community version of the WRF-Chem model and tested on cloud resolving scales to study the impact of the fires on the simulations of weathers. The authors concluded that the interaction of the aerosols with the atmospheric radiation led to significant modifications of vertical profiles of temperature and moisture in cloud-free region with the inclusion of the intense wild fires of 2004. On the other hand, when clouds existed, initial impact of the smoke appeared to decrease precipitation during the Alaska nighttime. However, during the afternoons, precipitation become convective and activity increased with fires. The submitted paper is well organized in scientifically and authors attempt to couple a plum rise algorism as well as biomass burning emissions model with the WRF-Chem model. Authors also took

account of direct and indirect effect of aerosol though special treatments of short wave radiation and explicit microphysics schemes and obtained reasonable results, compared with the previous studies. However, this paper suffers from lack of explanations for the reason of increased convective activity during the daytime with the inclusion of fires. The authors just cited the previous modeling studies and did not explain reasons of stronger convection with intense updraft and downdraft. It requires that the authors should emphasize effects of the additional complications introduced in their study though aerosol-radiation interaction and chemical processes on simulated results.

Specific : Page 7 Line 1: Authors mentioned that a prognostic treatment of cloud drop number was added to the Lin mps scheme. More detailed descriptions for a method of prognostic treatment of cloud number including the drop size distribution and microphysics processes related to the cloud drop number concentration are required

Page 11 Line 16: Adequate references for physics options selected in this simulation should be included.

Page 14 Line 15: As the authors mentioned, 000 UTC 5 July is the period when increased convection and rain take large parts of domain and the 0000 UTC soundings 5 July showed some improvement in the run with fires. Aerosol first indirect effect was also included in the model simulation. Please explain the positive effect of the first indirect effect on large scale environment fields.

Page 15 Line 18: What is the possible reason for the different maximum level between the fields shown in Fig. 6a b and c.

Page 16 Line 9: What is the possible reason for the greater difference between the two simulations towards the early afternoon? The run with fires results in more cloud coverage and reflects more downward short wave radiation?

Page 17: It would be better to separate one paragraph into two (one for Fig. 10 and the other for Fig. 11 and 12). In addition, changing the figure order (Fig. 11 and 12 first)

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could be considered.

Page 18: What is the CAPE, especially for the late afternoon convection case?

Page 19: As the authors mentioned, aerosol effects were not included in the convective parameterization. Comparison of the non-resolved precipitation amount between the simulations with fires and without fires is meaningful?

Page 20 Line 24: How does the interaction of aerosols with the atmospheric radiation cause the stronger storms with fires?

Technical :

Figrue 5: . . .shown in Fig. 5 are..→ Fig. 6 Figure 6: . . .(Shown in Fig. 4) → (Shown in Fig. 5)

Mssing the full name of RADM2, MADE/SORGAM, and MIRAGE

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 30613, 2010.