**Geoscientific
Model Development
Discussions**

Interactive comment on "The chemistry CATT–BRAMS model (CCATT–BRAMS 4.5): a regional atmospheric model system for integrated air quality and weather forecasting and research" *by* K. M. Longo et al.

Anonymous Referee #1

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Summary

The manuscript describes the newly developed model CATT-BRAMS. The development consists of expanding a regional atmospheric model (which is based on RAMS) with chemical, photochemical, and aerosol processes. The paper is well written, documents well the new model, and discusses the results of two simulations which are compared with observations. CATT-BRAMS is bound to provide interesting competition to the WRF/Chem model. The manuscript is in good shape, and only minor modifications,

listed in the following, are required before publication.

General comments

Please write out all acronyms - as a specific example, "RAMS", used on page 1177, or "ODEs" on page 1180 should be expanded. Also, formulas of chemical compounds should be identified when first introduced, for instance "... CH4 (methane) ".

Specific comments

Some English language issues should be addressed (please re-read the manuscript to check for issues beyond the examples given here). Some corrections pertaining to the clarity of text, decribed below, are also needed.

page1176, line 18: ... over long duration is still too computing time consuming ... → ... over long duration is computationally still too demanding ...

page1179, line 14: "... long wave radiations ..." → "... long wave radiation ..."

page1179, line 6: "... sub-grid diffusion ..."
page1191, line 13: "... vertical PBL diffusion ..."

Although (unresolved) sub-grid scale turbulence is (often) represented with diffusion-like terms in the dynamics equations of atmospheric models, it should be called "sub-grid scale turbulence" or "unresolved turbulence", not "sub-grid diffusion".

page1180, line 4: "... and lost of the species ..." → "... and loss of the species ..."

page1180, line 5: "The lost ..." → "The loss ..."

page1180, line 6: "... gaseous photochemistry, kinetic and aqueous chemistry ..." →

"... photochemistry, gas phase and aqueous chemistry ..." (chemists do not use the term kinetic chemistry)

page1181, line 14: "Gaseous kinetic and photochemistry" → This would likely mean "Gas phase kinetics and photochemistry", but "Gas phase and photochemistry" would be much clearer.

page1185, line 16: "where sis" → "where s is"

page1186, line 3: "The first one is the fact ..." It is not clear what this means.

page1186, line 15: "x" in equation 6 has not been declared as far as I can tell; please explain what x is.

page1186, line 19: "outmost" → "utmost"

page1187, line 12: "cache line conflicts" Do you mean "cache misses"? "Cache miss" is a much more common term than "cache conflict", and better describes the nature of the problem.

page1189, line 1: "The robustness of the CCATT-BRAMS system is explored throughout two case studies covering from the regional to local scale and from biogenic and fire emissions to urban emissions impacts." - A system is robust when it resists to perturbations and remains in a certain state despite the perturbations. However, what is being discussed in the manuscript is the evaluation of the model performance relative to observations. So it should read "performance" rather than "robustness".

page1189, line 25: "... measurements were already compared with several different models results," → "... measurements were previously compared with results from several different models (references here),"

page1195, line 9: "ratios follows" → "ratios follow"

page1195, line 22: "results tends" → "results tend"

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