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Comment on acp-2021-355

Anonymous Referee #3

Referee comment on "The regional impact of urban emissions on air quality in Europe: the role of the urban canopy effects" by Peter Huszar et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-355-RC2, 2021

The manuscript presents the analysis of the impact of the urban emissions changes on the concentrations of NO2, O3 and PM2.5 observed in 6 selected cities in central Europe. In the experiments, carried out with the use of 3 regional climate-chemistry models, the urban emission impact (UEI) is modulated by the urban canopy meteorological forcing (UCMF) for present day climate conditions (2015-2016). The structure of the manuscript, the results and the presentation of the material are very detailed and correctly worked out. The topic is relevant and suitable for publication in the ACP. I would, however, suggest a few minor changes and additions before publication.

General comments:

Some basic information on the selected cities should be provided, e.g. area, population, population density, main emission sources, etc. What are the differences/similarities between the cities?

Chapter 3.1. The validation part should be extended. Some measures of the model performance evaluation should be added. The Authors said that the full validation is described in Huszar et al. (2020b), however that paper gives the validation only for 4 out of 6 analyzed cities. The source (database) of the measurements and type of the stations used for the validation should be also provided.

Specific comments:

Line 1: replace „air-quality” by „air quality”

Line 2: replace „scales” by „scale”

Line 9: replace „rural one while” by „rural one, while”

Line 15: replace „In case of” by „In the case of”

Line 17: replace „air-pollution” by „air pollution”

Line 36: replace „Zha et al., 2019) while for turbulence (especially the vertical eddy diffusivity), strong” by „Zha et al., 2019), while for turbulence (especially the vertical eddy diffusivity) a strong”

Line 39: replace „scales” by „scale”

Line 40: replace „ones” by „one”

Line 45: replace „as well and” by „as well as”

Line 57: correct „et al., 20110(@).”

Line 58: please use subscript in „PNO3”

Lines 59-61: replace „Emissions of ammonia(NH3), although not emitted largely by cities, are an efficient contributor to formation of sulfate and nitrate aerosol (by forming ammonium-sulfates and ammonium-nitrates) and its importance in connection with city emissions is highlighted by many (e.g. Behera and Sharma, 2010, and references therein).”

by

„Ammonia (NH3), although not emitted largely by cities, is an efficient contributor to formation of sulfate and nitrate aerosol (by forming ammonium-sulfates and ammonium-

nitrates) and its importance in connection with city emissions is highlighted in many studies (e.g. Behera and Sharma, 2010, and references therein)."

Lines 69-73: replace „On global scale, e.g. Lawrence et al. (2007), Butler and Lawrence (2009), Folberth et al. (2010) or Stock et al. (2013) estimated urban emissions impact, while on regional scales, many studies focused on agglomerations in southern Europe (e.g. Im et al., 2011a, b; Im and Kanakidou, 2012; Finardi et al., 2014), but focused also on other important urban centers like Paris (Skyllakou et al., 2014; Markakis et al., 2015) or London (Hodneborg et al., 2011; Hood et al., 2018)." by

„On a global scale, the urban emissions impact was estimated by e.g. Lawrence et al. (2007), Butler and Lawrence (2009), Folberth et al. (2010) or Stock et al. (2013), while on regional scales, many studies focused on agglomerations in southern Europe (e.g. Im et al., 2011a, b; Im and Kanakidou, 2012; Finardi et al., 2014), but also on other important urban centers like Paris (Skyllakou et al., 2014; Markakis et al., 2015) or London (Hodneborg et al., 2011; Hood et al., 2018)."

Line 77: replace „available while" by „available, while"

Line 80: replace „CO as tracer recently in (Panagi et al., 2020)." by „CO as a tracer recently by Panagi et al. (2020)."

Lines 88-89: replace „particle matter (PM) while" by „particulate matter (PM), while"

Lines 99-100: remove „into account"

Lines 101-102: replace „Here we propose a study that connects the two aspects" by „In this study we propose the combination of the two aspects"

Line 107: replace „will be dedicated" by „will be paid"

Line 108: replace „(see e.g. Huszar et al. (2020a))." by „(see e.g. Huszar et al., 2020a)."

Line 109: replace „particle matter" by „particulate matter"

Line 109: replace „then” by „than”

Line 118: replace „Two models regional climate models” by „Two regional climate models”

Line 129: replace „based on (Oleson et al., 2008).” by „based on Oleson et al. (2008).”

Line 131: replace „(Chen and Sun, 2002, PLIN;)” by „(PLIN; Chen and Sun, 2002)”

Lines 132-133: replace „(SLUCM; (Kusaka et al., 2001))” by „(SLUCM; Kusaka et al., 2001)”

Lines 134-135: replace „(RADM2; Stockwell et al. (1990, 2011))” by „(RADM2; Stockwell et al., 1990; 2011)”

Line 136: replace „(MADE/SORGAM; Schell et al. (2001))” by „(MADE/SORGAM; Schell et al., 2001)”

Line 145: replace „in to” by „into”

Lines 146-147: replace „CAMx code http://www.camx.com/download/support-software.aspx was used for WRF data while”

by

„CAMx code (http://www.camx.com/download/support-software.aspx) was used for WRF data, while”

Line 148: replace „eddy diffusion” by „eddy-diffusion”

Line 154: replace „9km, 3km and 1km resolution” by „9 km, 3 km and 1 km resolution”

Line 167: replace „simulations,the” by „simulations, the”

Line 170: The parenthese is empty

Line 172: replace „considered while” by „considered, while”

Line 175: replace „The fulfill the goal” by „To fulfill the goal”

Line 175: replace „have to performed” by „have been performed”

Line 180: replace „Tab.1” by „Table 1”

Line 186: replace „considered while” by „considered, while”

Line 189: replace „eddy diffusion” by „eddy-diffusion”

Line 208: replace „republic” by „Republic”

Line 211: replace „nitrogen(NOx)” by „nitrogen (NOx)”

Line 240: replace „the regional climate” by „RCM”

Line 240: replace „Tab. 1” by „Table 1”

Line 242: replace „models” by „model”

Line 253: replace „ozone while” by „ozone, while”

Line 261: replace „expect” by „except”

Line 273: replace „impact shown in the first one while” by „impact is shown in the first one, while”

Line 285: replace „not confined” by „not limited”

Line 290: replace „(seen in Huszar et al. (2020b))” by „(see Huszar et al., 2020b)”

Line 294: replace „then” by „than”

Line 297: replace „then” by „than”

Line 298: replace „then” by „than”

Line 301: replace „For PM2.5 again,” by „For PM2.5 (Fig. 5) again,”

Line 301: replace „NO2.The” by „NO2. The”

Line 302: replace „0.5μgm−3” by „0.5 μgm−3”

Line 304: replace „6μgm−3” by „6 μgm−3”

Line 310: replace „During JJA,” by „During JJA (Fig. 6),”

Line 316: replace „on regional ozone” by „on regional ozone (Fig. 7)”

Line 318: replace „In case CAMx” by „In case of CAMx”

Line 325: replace „due to urban” by „due to the urban”

Line 332: replace „ozone while” by „ozone, while”

Line 340: replace „hours while” by „hours, while”

Lines 340-341: replace „different of urban emission impact” by „different impact of urban emission”

Line 341: replace „therefor” by „therefore”

Line 348: replace „respectively while” by „respectively, while”

Line 351: replace „respectively while” by „respectively, while”

Line 353: replace „and4.” by „and 4.”

Line 354: replace „models” by „model”

Line 361: replace „respectively while” by „respectively, while”

Line 363: replace „and6.” by „and 6.”

Line 365: replace „In case of ozone,” by „In case of ozone (Fig. 10),”

Line 369: replace „cases while” by „cases, while”

Line 375: replace „WRF-Chem) while in JJA, the” by „WRF-Chem), while in JJA the”

Line 385: replace „rule” by „role”

Line 395: replace „ozone, Fig. 13,” by „ozone (Fig. 13),”

Line 399: replace „Fig/ 7.” by „Fig. 7.”

Line 409: replace „are considered” by „is considered”

Line 420: replace „case.” by „case are presented.”

Line 427: replace „windspeeds” by „wind speed”

Line 431: replace „with highest” by „with the highest”

Line 440: replace „air-quality” by „air quality”

Line 446: replace „to measurements” by „to the measurements”

Line 455: replace „by (Nopmongcol et al., 2012).” by „by Nopmongcol et al. (2012).”

Line 491: replace „eddy diffusion” by „eddy-diffusion”

Line 491: replace „wind-speeds” by „wind speed”

Line 520: replace „and important” by „an important”

Line 521: replace „This caused” by „This is caused”

Line 524: replace „are largest” by „are the largest”

Line 524: replace „wind-speed” by „wind speed”

Line 526: replace „During that the” by „During that time the”

Line 531: replace „eddy diffusion” by „eddy-diffusion”

Line 533: replace „see (Karlický et al., 2020)).” by „see Karlický et al., 2020).”

Line 535: replace „their” by „the”

Line 538: replace „wind-speed” by „wind speed”

Line 539: replace „the the modulation” by „the modulation”

Page 29, Fig. 3 caption: replace „five selected cities” by „six selected cities”

Page 35, Fig. 11 caption: replace „The urban emission impact (UEI) of selected cities” by „The impact of urban emission (UEI) for selected cities”

Page 38, Fig. 14 caption: replace „eddy diffusion” by „eddy-diffusion”