

Interactive comment on “SMOKE for Europe – adaptation, modification and evaluation of a comprehensive emission model for Europe” by J. Bieser et al.

Anonymous Referee #1

Received and published: 4 October 2010

The authors present and document the development of the Sparse Matrix Operator Kernel Emissions (SMOKE) processing system for its application in Europe. This manuscript fits well within the scope of GMD and gives useful information on the treatment and preparation of emission datasets as inputs to chemistry-transport models (CTMs). However, it does not provide a thorough critical perspective on the methods used to produce emission inventories. This may be due to the lack of documentation on existing emission models. I would suggest relating a bit more the methodology that has been developed in the present work to what others are doing (e.g. does other emission models use surrogates? If so, which ones?). The modelling approach used in the manuscript has been thought through and does not raise any big point of concern.

C391

I am pleased to recommend the manuscript for publication in GMD after the authors take into account the suggestion above and clarify the minor points (mostly editorial), which are detailed in the following. Referring to the page number and line:

P950, L6: Please change ‘CTM’ to ‘CTMs’.

P950, L11: Please change ‘state of the art’ to ‘, state-of-the-art,’.

P950, L11-13: The sentence ‘Differences of SMOKE-EU to those models were in the same range as the differences amongst them.’ does not read easily. I would suggest changing it to ‘SMOKE-EU produced a range of values comparable to the other three datasets.’.

P950, L15: Please change ‘Using SMOKE-EU emissions O_3 , NO_2 and SO_4 could be modelled most reliably.’ to ‘Using SMOKE-EU gave the most reliable modelling of O_3 , NO_2 and SO_4^{2-} ’. Please change ‘ SO_4 ’ to ‘ SO_4^{2-} ’ throughout the manuscript.

P950, L17-19: Please add a comma between ‘ $F_2=\#$ ’ and ‘ $N=\#$ ’.

P950, L19: Please change ‘ NH_4 ’ to ‘ NH_4^+ ’ and ‘ NO_3 ’ to ‘ NO_3^- ’ throughout the manuscript.

P950, L25-26: Please delete the sentence ‘The results of this comparison confirm that it is adequate to use emissions created by SMOKE-EU as input for CTMs.’. I do not think that this sentence helps. By the way, I do not believe that this was the goal of the present work. You may want to say something like ‘SMOKE-EU provides an alternative to prepare emission data as input for CTMs.’.

P951, L4: Please change ‘reaching’ to ‘ranging’.

P951, L5: Please correct ‘introduce’ to ‘introduces’ and change ‘uncertainty to’ to ‘uncertainty in’.

P951, L8: Please put ‘Bottom-Up’ between single quotes ‘’.

P951, L9-10: Please add ‘By definition,’ before ‘the source is’.

P951, L12: Please change ‘reasonable’ to ‘practicable’. Please remove ‘Thus,’.

P951, L13: Please change ‘lumped’ to ‘combined’.

P951, L15-16: Please change ‘The opposite methodology is the Top-Down approach.’

C392

It is used for groups of individual sources which can not be easily lumped' to 'The opposite methodology, the 'Top-Down' approach is used for groups of disparate sources which can not be easily combined'.

P951, L24: Please correct 'there is' to 'there are'.

P951, L25: Please add 'of' before 'input data'.

P951, L27: Please put 'which are not publicly available' between commas.

P951, L28: Please change 'own restrictions: compatibility' to 'own restrictions, e.g. compatibility'.

P952, L2: Please change 'high' to 'large'.

P952, L7: Please change 'to create emissions' to 'to prepare emission data'.

P952, L10: Please move the references before 'but are not public' on P952, L9.

P952, L13-14: Please delete 'before' before 'mentioned' and change 'some examples and do not cover all European emission models' to 'representative examples of the European emission models'.

P952, L14: Please change 'Looking at' to 'Given'.

P952, L15-16: Please change 'what benefit can be gained by an additional model' to "What benefit can be gained from an additional model?".

P952, L16: Please change 'The reason to develop' to 'The rationale for'.

P952, L19: Please change 'concerning' to 'as regards'.

P952, L19-20: Please put 'or different photochemical splits' between commas.

P952, L20: Please change 'implemented' to 'included'.

P952, L21: Please change 'means that' to 'requires that'.

P952, L22: Please add 'in' before 'approach'.

P952, L24: Please change 'This approach' to 'Such an approach'.

P952, L25: Please change 'inconsistency' to 'compatibility'.

P952, L26: Please change 'available' to 'compatible'.

P953, L5: Please change 'concerning' to 'with respect to'.

P953, L6: Please add a comma after 'Furthermore'.

C393

P953, L26: Please change 'follows' to 'uses'.

P954, L2: Please put 'and their function' between commas.

P954, L3: I would make sense to refer to Appendix A before B and C. Please make sure that the references to the appendices are done in the alphabetical order.

P954, L5: There are differences between 'plume rise calculations' and 'Plume in Grid (PiG) calculations'. I am not sure what the authors are referring to for the treatment of large point sources. I guess that the authors are referring to 'plume rise calculations'. This needs to be clarified in the manuscript.

P954, L14: Please change 'source and use the best fit' to 'source, using the best fit'.

P954, L26: Please change 'sound' to 'valid' and 'spatially static like for example' to 'spatially static, for example'.

P955, L1: Please change 'inhomogeneous' to 'heterogeneous'.

P955, L5: Please change 'strong' to 'large'.

P955, L8: Please change 'been introduced. It's basic function' to 'been introduced whose basic function'.

P955, L10: Please add 'the' before 'modification matrix'.

P956, L14: Please change 'is changed' to 'vary'.

P956, L15: Please change 'not used anymore' to 'redundant'.

P956, L19: Please change 'is able to create high resolution emissions for Europe' to 'can be used to prepare high resolution emission data for Europe'.

P956, L20: Please change 'are the numerous' to 'is the numerous'.

P957, L2: Please change 'inhomogeneous' to 'heterogeneous'.

P957, L3: Please correct 'asses' to 'assess' and change 'the national emissions' to 'their national emissions'.

P957, L4: Please put 'possibly using different emission factors' between commas.

P957, L5-6: I would suggest changing 'Also, some countries do not publish their emission inventories. Furthermore most countries uses' to 'Amongst those countries which

C394

do publish their emission inventories most countries use’.

P957, L12-13: Please put ‘by the parties under the LRTAP convention’ between commas.

P957, L15: Please correct ‘data are published’ to ‘data is published’ and ‘that was reviewed’ to ‘that has been reviewed’.

P957, L17: Please put ‘including Russia’ between commas.

P957, L24: I would suggest changing ‘comparable’ to ‘compatible’.

P957, L26: Please change ‘national reports also emissions’ to ‘national reports, emissions’.

P958, L10: Please change ‘and 2004. This is mainly due to’ to ‘and 2004, mainly due to’ and ‘release’ to ‘data’.

P958, L11: Please change ‘Here, only the 2004 inventory is used for’ to ‘We have used only the 2004 inventory for’.

P958, L17: Please change ‘high’ to ‘large’.

P958, L27: Please put ‘for certain species and sector’ between commas.

P959, L8: Please delete the sentence ‘First the EPER...’.

P959, L9: Please change ‘still are’ to ‘are still’.

P959, L10-12: Please change ‘sources distinguished by industrial sector. While, concerning industrial sources, SNAP distinguishes between two processes’ to ‘sources, distinguished by industrial sector, while SNAP differentiates between two general processes’.

P959, L22: Please change ‘disaggregate’ to ‘allocate’.

P960, L1: Please add ‘as the basis’ before ‘for anthropogenic emissions’ and ‘(2009)’ after ‘Maes et al.’, and delete ‘(2009)’ on P960, L4.

P960, L12: Please add ‘the’ before ‘default’.

P960, L15: Please delete ‘over the official website’.

P960, L22: Please add ‘a’ before ‘surrogate’.

C395

P960, L25: Please change ‘world containing’ to ‘world. It contains’.

P960, L27: Please change ‘could be achieved’ to ‘has been achieved’.

P961, L3: Please change ‘Besides others it contains data about roads’ to ‘it contains data on roads’.

P961, L6: Please change ‘is used’ to ‘was used’.

P961, L8-9: Please change ‘for UBA (Federal Environment Agency) created Forest database (JRC/TNO) which distinguishes 136 different tree types and the CLC2000 landuse dataset’ to ‘Forest database (JRC/TNO), which distinguishes 136 different tree types and was created for UBA (Federal Environment Agency), and the CLC2000 landuse dataset’.

P961, L16: Please change ‘The model estimates for policies as road pricing’ to ‘The model provides estimates for policies such as road pricing’.

P962, L3: Please correct ‘data are’ to ‘data is’.

P962, L15: Please change ‘lower’ to ‘less’.

P962, L20: Please change ‘emissions’ to ‘emission sources’.

P963, L21: Please add a comma after ‘For all CTMs’ and change ‘distributed’ to ‘separated’.

P965, L2: Please correct ‘seperatly’ to ‘separately’.

P965, L5: Please change ‘exemplary’ to ‘selected’.

P965, L8: Please change ‘validate’ to ‘evaluate’.

P965, L15: Please change ‘AQ’ to ‘air quality’.

P965, L18-19: Please delete the sentence ‘For comparison...’.

P966, L6-7: Please delete the sentence ‘For comparison...’. Please add a new paragraph starting with ‘Emission datasets are compared for the GKSS 54x54 km² modelling domain.’.

P966, L9: Please change ‘from sector SNAP2’ to ‘from the sector SNAP2 of the EMEP’.

C396

emission dataset'.

P966, L10: Please add 'a' before 'static'.

P966, L15: Please delete 'which are'.

P966, L16: Please add a full stop at the end of the sentence.

P966, L17: Please change 'impacts' to 'effects'.

P966, L18: Please change 'its impacts' to 'these'.

P966, L20: Please change 'big' to 'large'.

P966, L22: How can we get differences in annual total emissions? Whether Modmat is used or not, annual total emissions are the same. Please explain.

P966, L23: Please change 'is not following monthly average profiles any more' to 'no longer follows monthly average profiles'.

P966, L28: Please delete 'behaviour' after 'opposite'.

P967, L3: Please change 'to the default' to 'in the default'.

P967, L6: Please change 'concentrations of' to 'concentrations for'.

P967, L20: Please put 'as well as emissions from international shipping' between commas.

P967, L23: Please check in the guide for authors whether to use '/yr' or '/a' in the manuscript.

P968, L16: Please add 'i.e.' before 'whether'.

P968, L18-19: Please change 'For most species almost no difference in the frequency distribution can be seen' to 'For most species there is almost no difference in the frequency distribution'.

P968, L22: Please change 'standard' to 'reference'.

P968, L23: Please add 'from those of the EMEP dataset' after 'emissions'.

P968, L24: Please delete the sentence 'The EMEP dataset...'

P969, L7: Please move Eq. 7 after L8, P969.

P969, L8: Please add a comma after 'distribution'.

C397

P969, L14: Please add a comma after 'comparison' and move 'also' between 'have' and 'been'.

P969, L16: How does the reference to Fig. 7 help in the interpretation? I would suggest referring to Fig. 7 at the end of §3.1.

P969, L17: Please move 'still' after 'can'.

P969, L19-20: Please change 'lowest square differences. This indicates a lower amount of grid cells with much higher emissions than the origin cell, which is most probably due to' to 'lowest square differences, which indicates a lower amount of grid cells with much higher emissions than the origin cell. This is most probably due to'.

P970, L6-9: Please delete the paragraph, which states the obvious.

P970, L20: Please put 'which mainly occur during summer' between commas.

P970, L22: Please change 'strong' to 'large'.

P971, L10: See my comment on P954, L5.

P971, L12: Please change 'significant' to 'large'.

P971, L17: Please move the reference after 'US EPA' on L16, P971.

P971, L18: Please add 'the' before 'surrounding'.

P971, L26: Please change 'these models considering biogenic emissions' to 'these datasets which takes into account biogenic emissions'.

P972, L2: Please change 'to observations' to 'with observations'.

P972, L4: How does the reference to Fig. 7 help in the interpretation?

P972, L5: Please change 'skipped' to 'excluded'.

P972, L9: Please add 'the' before 'species'.

P972, L11: Please change 'can' to 'may'.

P972, L12: Please change 'the CTM as well as by the meteorological model' to 'the CTM, the meteorological model'.

P972, L13: Please add 'for' before 'instrumental reasons'.

P972, L17: Please change 'were chosen following' to 'were selected based on those

C398

suggested by'.

P972, L18: Please delete 'all used' before 'statistical'.

P972, L26: Please correct 'change' to 'changes' and put 'in certain regions' between commas.

P973, L4: Please delete 'In this setup' and put 'calculated by CMAQ' between commas.

P973, L5: Please change 'than the observations' to 'those observed' and 'Tests' by 'Test runs'.

P973, L8: Please change 'Looking at' to 'Considering' and add 'daily' between 'highest' and 'mean'.

P973, L9: Please change 'in the SMOKE-EU case' to 'when using the SMOKE-EU dataset'.

P973, L10: Please change 'while the other two cases underestimate' to 'while the other two datasets lead to an underestimation of'.

P973, L11: Please add 'and Table 5' after 'Fig. 13' and change 'were' to 'where'.

P973, L15: Please change 'can be explained by the different' to 'may be explained by different'.

P973, L19-20: Please change 'meteorological aspects are different in higher altitudes' to 'meteorology may be significantly different at higher altitudes'.

P973, L23-24: Please change 'assumption' to 'finding'.

P973, L24-25: Please change 'higher values for correlation' to 'greater correlation'.

P973, L26: Please change 'seen' to 'observed'.

P973, L27: Please add 'the' before 'exception'.

P973, L28: Please delete 'on the other hand'.

P973, L29: Please delete 'However,'.

P974, L1: Please change 'would go' to 'is'.

P974, L4: Please change 'all species' to 'all the species'.

P974, L6: Please change 'all species' to 'all the species'.

P974, L8: Please change 'of this dataset' to 'in this dataset'.

C399

P974, L9: Please change 'On the other hand' to 'However' and add 'in this dataset' after 'emissions'.

P974, L10: Please delete 'in the IER-GKSS case' and 'Accordingly'.

P974, L11: Please change 'Other than expected' to 'Unexpectedly'.

P974, L16: Please change 'amount' to 'number'.

P974, L19: Please delete 'Especially'.

P974, L20: Please add a comma after 'located'.

P974, L23: Please change 'adopted and modified' to 'adapted'.

P974, L24: Please delete 'in order'.

P974, L25: Please change 'which' to 'to'.

P974, L26: Please change 'to create the input data necessary to run the SMOKE' to 'into input data required to run SMOKE'.

P974, L27: Please change 'emissions' to 'emission data'.

P975, L3: Please change 'of up to' to 'as fine as'.

P975, L4: See my comment on P954, L5.

P975, L6: Please change 'reaction schemes' to 'mechanisms'.

P975, L11: Please add 'of the species' after 'distributions'.

P975, L14: Please change 'summers' to 'summer'.

P975, L20: Please delete 'It could be shown that'.

P975, L22: Please correct 'lead' to 'led'.

P975, L26: Please put 'which are strongly influenced by the meteorology' between commas.

P975, L28-29 and P976, L1: Please delete the sentence 'By comparison...'

P976, L4: Please change 'are different' to 'include' and 'further' to 'other'.

P976, L5: Please add a comma after 'mechanisms' and 'i.e.' before 'benzo[a]pyrene'.

P976, L10: delete 'from Measurement'.

P979, L7: Please correct 'specie' to 'species' and add a full stop at the end of the

C400

sentence.

P979, L9: Please add a full stop at the end of the sentence.

P980, L1: Please change 'with' to 'of'.

P980, L4: Please change 'Select elevated sources and to prepare' to 'Selects elevated sources and prepares'.

P980, L10: Please change 'AQM' to 'CTM'.

P980, L12: Please add a full stop at the end of the sentence.

P980, L15: Please add a full stop at the end of the sentence.

P980, L17: Please add a full stop at the end of the sentence.

P980, L24: Please add 'providers of the' before 'open source online databases'.

P987, Table 2: Please change the font of the 'Biogenic' row to oblique.

P989, Table 4: Please indicate the unit for 'Altitude'. Please indicate which year it is for.

P990, Table 4: Please indicate the unit for 'Altitude'. Please indicate which year it is for.

P992, Table 6: Please explain what is 'mean concentrations' (mean daily concentrations for the year 2000?). Please indicate the units for SO_4^{2-} and SO_2 . Please indicate which year it is for. Please refer to Table 4 for the list of the stations.

P994, Fig 2.: caption – Please indicate which year(s) and domain it is for. Does '(all values averaged over the whole domain)' apply to '(a)' as well? I would suggest changing 'modified version' to 'SMOKE-EU'.

P995, Fig 3.: caption – Please indicate which domain it is for. Please indicate that this is for different emission datasets.

P996, Fig. 4: caption – Please change 'Relative annual total emissions of the EU27 (biogenic emissions are not included)' to 'Annual total emissions of the EU27 (biogenic emissions are not included) relative to those of EMEP'. Please indicate which year and domain it is for. Please indicate that this is for different emission datasets. Please note the typo ('Realative') in the title of the plot.

C401

P997, Fig. 5: caption – Please indicate which year and domain it is for. Please indicate that this is for different emission datasets.

P998, Fig. 6: caption – Please indicate which year and domain it is for. Please indicate that this is for different emission datasets.

P1000, Fig. 8: caption – Please indicate which year and domain it is for. Please indicate that this is for different emission datasets.

P1001, Fig. 9: caption – Please indicate which year and domain it is for. Please indicate that this is for different emission datasets.

P1002, Fig. 10: caption – Please indicate which year and domain it is for. Please indicate that this is for different emission datasets.

P1003, Fig. 11: caption – Please indicate which year and domain it is for. Please indicate that this is for different emission datasets.

P1004, Fig. 12: caption – Please indicate which year it is for. Please indicate that this is for different emission datasets. Please note that 'factor of two' is not given as a percentage in the plot c.

P1005, Fig. 13: caption – Please indicate which year it is for. Please indicate that this is for different emission datasets. Please note that 'factor of two' is not given as a percentage in the plot c. Please change 'hourly observations' to 'daily mean observations'.

P1006, Fig. 14: These diagrams are not 'standard' Taylor diagrams, which present skill variance along the radial axis. Please explain the country acronyms in the caption.

P1007, Fig. 15: caption – Please indicate which year it is for. Please indicate that this is for different emission datasets. Please indicate the time resolution of the observations.

Supplementary materials, Figs. 16-19: caption – Please indicate which year and species it is for. Please indicate that this is for different emission datasets. Please indicate the time resolution of the observations. Please note that 'factor of two' is not given as a percentage in the plot c.

C402

