

Interactive comment on “VEIN v0.2.2: an R package for bottom-up Vehicular Emissions Inventories” by Sergio Ibarra-Espinosa et al.

Anonymous Referee #2

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This paper presents a very valuable contribution to the development of emission inventories of mobile sources with the necessary resolution to run a chemical transport model at a regional scale.

This issue is of growing interest in developing countries, where the control of air quality becomes increasingly critical. The model is even more valuable because it is developed in a language of free availability. It is based on the model used in Europe (COPERT), and also uses data measured in Brazil. This fact of course adds value but, on the other hand given the special fuel mix used in Brazil, some of these values (particularly those corresponding to organic compounds) may be biased. In any case, in general terms, the program presents flexibility for the use of other data, and for that reason its use in other regions is possible. For all the above, I suggest accepting this work for publication

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after some minor corrections detailed below.

1. The relationship between hourly average speed and traffic flow is given by equation 4, which includes the parameters α and β . The authors suggest default values but allow the users of the model to choose local data. Perhaps with a better explanation about the variable Capacity this issue will be clarify but, in any case, the explanation on how these default values were established is needed, and to what extent they depend on the local type of fleet / circulation circumstances.

2. In the Emission Factors options explained in item 2.2, it is not clear the difference between the option 2) Emission factors from local sources (line 31, page 4) and the $EF_{local,j,k,m}$ that represents the constant emission factor (not speed functions). If they represent the same (i.e. the EFs measured in any place, on the basis of dynamometer's experiments) the authors should explain why the option 2) is given. In the case to have other experiments, such as on-road measurements or tunnel studies, how these numbers are included? This item has to be expanded in order to give more details about the use of local EFs data.

3. The authors does not mention the difference in the emissions regarding the type of fuel used, which is particularly relevant for example in Brazil where almost all new cars sold can run on any combination of gasoline and ethanol. This deserve clarifications in several parts of the manuscript:

3.a. Deterioration factors: The model includes an emission factor database (fe2015) that does not include this factor. Nevertheless the authors report the use of deterioration factors from Ntziachristos and Samaras (2016), who said that these factors should not be used to provide the deterioration of emissions where an older fuel is used in a newer technology (e.g. use of Fuel 2000 in Euro 4 vehicles) and, therefore, cannot be used for other type of fuels. This reviewer agrees that it is necessary to make some consideration in this regard, and that the availability of these numbers is scarce, so that considering European values (due to the lack of better ones) is a valid option. How-

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ever, it is necessary to prevent end users of the model about this assumption including a comment in the manuscript because it is known that the use of ethanol accelerates the deterioration of the engine.

3.b. Speciation schemes –dependence with fuel composition. An unknown set of schemes from Rafee (2015), whose reference is in Portuguese, has been considered. It is necessary to include a brief explanation about this work including, for example, which type of fuels these schemes include.

4. The data of vehicle start pattern taken from the IVE experience in Brazil, how can be extrapolated to other cities/regions? Please, clarify the variability of this parameter, and its dependence on the type of technologies used in the different countries.

5. Minor comments 5.a. : Page 5 line 28 “ studies report that when ambient temperature is -7C, emissions are one order of magnitude higher than at 22C (Ludykar et al., 1999)”, please clarify the corresponding pollutant (the numbers are totally different between compounds).

5.b. In Page 4 line 25 the authors define the meaning of Emission factor, referring to Tinus Pulles definition, but for the manuscript define “an emission factor is the mass of pollutant emitted by the vehicular type, technology and years of use”, but the activity data was not included in the definition (km travelled). 5.c. Page 5 lines 8 to 11: Mileage driven with a cold engine/catalyst: the authors said that they included in the model the cold starts recorded during the implementation of the International Vehicle10 Emissions (IVE) model, but is not enough clear if the data from COPERT are also included. Please, also clarify if other data about this parameter may be included by other modelers.

5.d. Page 6 line 5: “This is an important aspect that will be reviewed in future versions of VEIN”. Please, clarify the intention.

5.e. It is not clear the input data needed to estimate the daily cycle, (1) rush hours

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during the morning pick or (2) the available data in each country/city, combining with a TF matrix accordingly, with a value of 1 for the maximum flow, at the time that it occurs.

5.f. Please, clarify if it would be possible to include other speciation schemes

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