Strategies to cut vehicular green house emissions

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Abstract

There are consensous among scientists about the human activities induces global warming in the last century (Cook et al, 2013, Cook et al, 2016). CO2 is the most important gas for radiative forcing. Also, it has been proven that reducing Black Carbon (BC) emissions would help to lower global radiative forcing and improve population health (Bond et al., 2013). Transport emissions are increasingly more important in terms of green house gases (GHG). Therefore, identifying strategies to cut GHG it is important to fight back against climate change. We estimated the vehicular emissions of Black Carbon over the Metropolitan Area of São Paulo (MASP) of BC. We used the model VEIN, an R package that allows to estimate vehicular emissions with high level of detail, as in spatial and temporal dimensions (Ibarra, 2017). The strategies considered are the scrapping of vehicular older than 30 years of use as these vehicles. Black Carbon Would diminish 113 t/y

Methods

TRAFFIC

We used a morning rush traffic simulation for MASP. This traffic simulation is made by the Traffic Company of São Paulo (CET). VEIN model performs this task automatically

$$F_{i,j,k} = Q_i \cdot VC_{i,j} \cdot TF_{j,k}$$

Traffic is splitted by type of vehicle and extrapolated to each hour of the week. VEIN function: ***age_ldv*** and ***age_hdv***.

SPEED

We used BPR curves to estimate speed. VEIN function: ***netspeed***

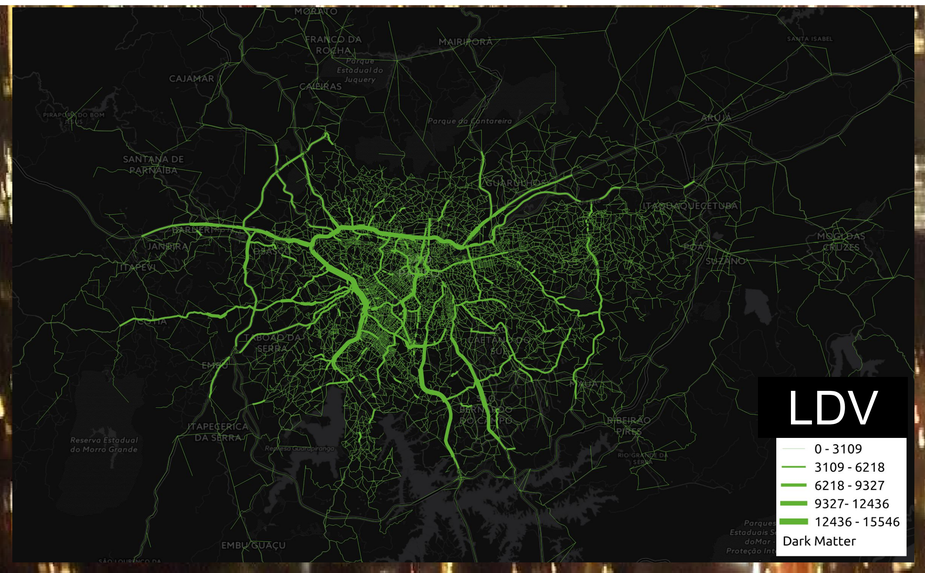
$$T_{i,k} = To_i \cdot \left(1 + \alpha \cdot \left(\frac{Q_{i,k}}{C_i}\right)^{\beta}\right)$$

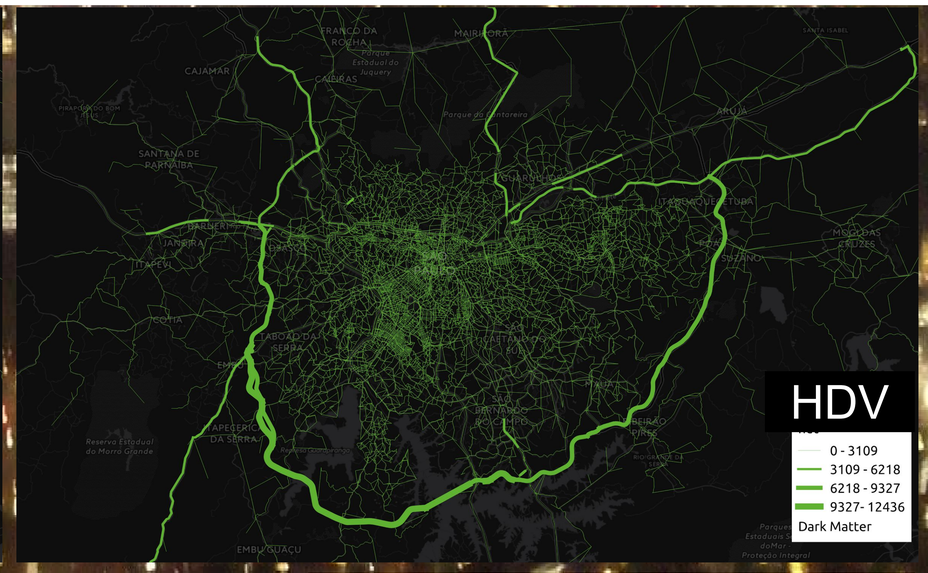
EMISSIONS

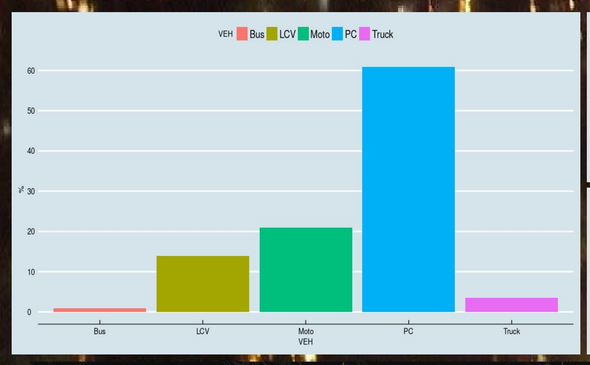
We consider length of street, emissions factors depending on speed and deterioration factors

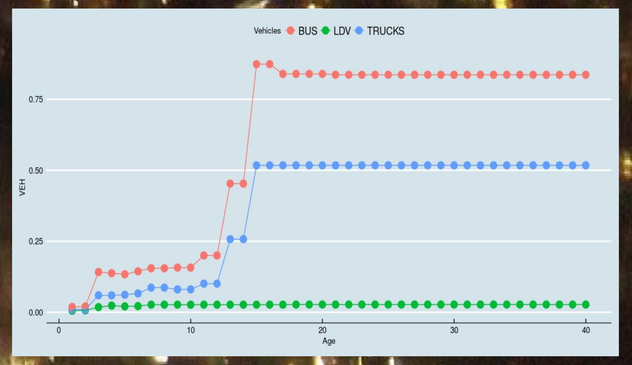
$$E_{i,j,k,l} = F_{i,j,k} \cdot L_i \cdot EF(V_{i,k})_{j,l} \cdot DF_j$$

Materials

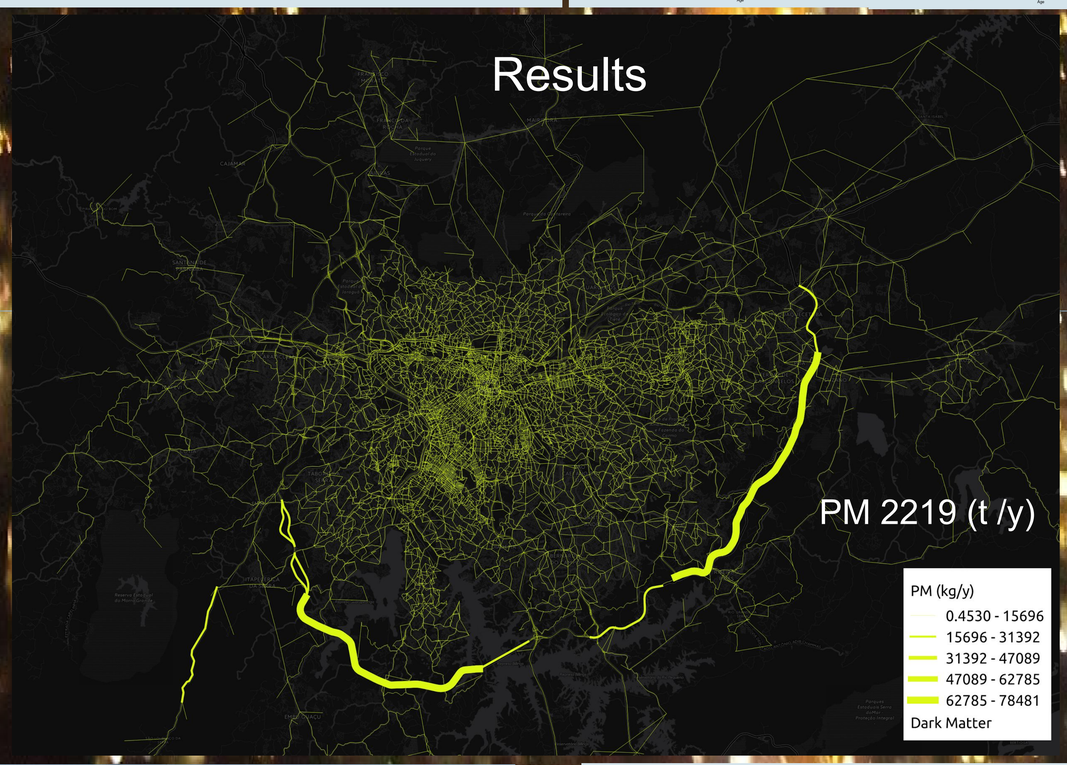


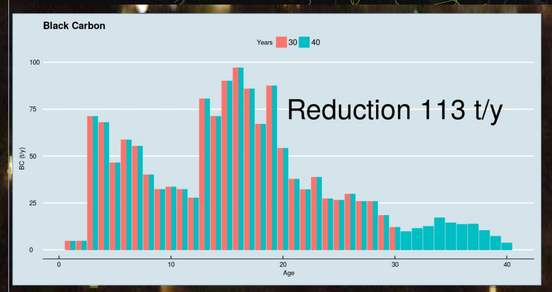


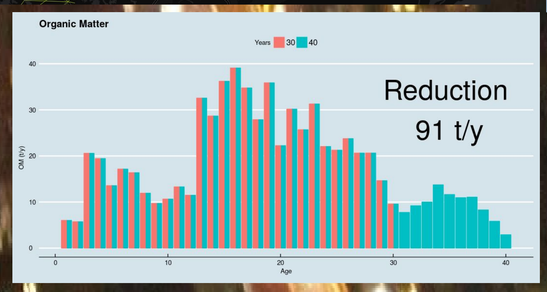




Results







vein: Vehicular Emissions Inventories

Emissions inventories elaboration and visualization, consists the three stages, pre-processing activity data, processing or estimating the emissions and post-processing of emissions in maps and databases.

Version:	0.2.1-4
Depends:	R (≥ 2.10), sp
Imports:	graphics, raster, rgeos, stats, units
Suggests:	knitr, rmarkdown, RColorBrewer
Published:	2017-05-14
Author:	Sergio Ibarra Espinosa
Maintainer:	Sergio Ibarra Espinosa <zergioibarra at gmail.com>
BugReports:	https://github.com/ibarraespinosa/vein/issues/
License:	MIT + file LICENSE
URL:	https://github.com/ibarraespinosa/vein
NeedsCompilation:	no
Citation:	vein citation info
Materials:	NEWS
CRAN checks:	vein results

Downloads:

Reference manual:	vein.pdf
Package source:	vein_0.2.1-4.tar.gz
Windows binaries:	r-devel: vein_0.2.1-4.zip, r-release: vein_0.2.1-4.zip, r-oldrel: vein_0.2.1-4.zip
OS X El Capitan binaries:	r-release: vein_0.2.1-4.tgz
OS X Mavericks binaries:	r-oldrel: vein_0.2.1-4.tgz

Linking:

Please use the canonical form https://CRAN.R-project.org/package=vein to link to this page.

VEIN model and estimation

VEIN model allows a detailed estimation of vehicular emissions. It cover hot engine, cold start, evaporative, speciation and other type of emissions. The model is available at https://cran.r-project.org/web/packages/vein/index.html and https://github.com/ibarraespinosa/vein