Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2017-1091-AC1, 2018

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Emissions databases for polycyclic aromatic compounds in the Canadian Athabasca Oil Sands Region – development using current knowledge and evaluation with passive sampling and air dispersion modelling data" *by* Xin Qiu et al.

Xin Qiu et al.

irene.cheng@canada.ca

Received and published: 23 January 2018

Response to Reviewer #1

We appreciate the comments by the reviewer to help us improve the paper. Our responses to the specific comments are shown below.

This paper developed two speciated and spatially-resolved emissions databases for

Printer-friendly version

Discussion paper

polycyclic aromatic compounds (PAC) in the Athabasca oil sands region (AOSR), and compared the two emissions databases with the measurements from a passive air monitoring network. Papers have a high degree of novelty and I recommend to publish after a minor revised.

1. Please delete some basic concepts, concise articles.

Response: We condensed and deleted some of the basic information (e.g. basics about PAHs in the first paragraph of the introduction) in the revised paper to keep it concise.

2. What are the PAHs in CEMA database and JOSM database, respectively? Are they the same?

Response: The 16 parent PAHs are the same in the CEMA-derived and JOSM-derived emissions databases. As mentioned in sect. 2.2, the PAHs include: naphthalene (NAPH), acenaphthylene (ACY), acenaphthene (ACE), fluorene (FLR), phenanthrene (PHEN), anthracene (ANTH), fluoranthene (FLRT), pyrene (PYR), benz[a]anthracene (BaA), coeluting chrysene and triphenylene (CHRY_TRIP), benzo[b]fluoranthene (BbF), benzo[k]fluoranthene (BkF), benzo[a]pyrene (BaP), indeno[1,2,3-cd]pyrene (I123cdP), dibenz[a,h]anthracene (dBahA) and benzo[ghi]perylene (BghiP). However, total alkylated PAHs and dibenzothiophenes (DBT) emissions were only estimated for the JOSM-derived emissions database, since the monitoring of these additional compounds is part of monitoring activities under the JOSM program. This will be clarified in the revised paper.

3. In Results and Discussion, please describe the same meteorological data in detail.

Response: The meteorological data input for the CALMET model was described in sect. 2.2. A more detailed description will be provided in the revised paper.

CALPUFF takes three-dimensionally varying wind, temperature and turbulence fields from the CALMET model. The 3-D winds and temperature fields from CALMET are

reconstructed using meteorological measurements, orography and land use data. Besides wind and temperature fields, CALMET determines the 2-D fields of micrometeorological variables needed to carry out dispersion simulations (mixing height, Monin Obukhov length, friction velocity, convective velocity, etc.). A two-step approach is typically used to compute the wind fields in CALMET. In the first step, an initial guess wind field is adjusted for kinematic effects of terrain, slope flows, and terrain blocking effects to produce a Step 1 wind field. The second step applies an objective analysis procedure to introduce observational data into the Step 1 wind fields to produce the final wind fields. In this study, CALMET used the Weather Research and Forecasting (WRF) model due to its capability of simulating regional flows and certain aspects of local meteorological conditions such as complex terrain. It replaces the two-step approach because of the higher spatial resolution of the WRF output compared to observational data. The output of the CALMET model is directly interfaced with the CALPUFF dispersion model for further air quality modelling.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2017-1091, 2017.

Printer-friendly version

Discussion paper