

## ***Interactive comment on “Principal component analysis of summertime ground site measurements in the Athabasca oil sands: Sources of IVOCs” by Travis W. Tokarek et al.***

**Anonymous Referee #2**

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This study investigates the sources of IVOCs in the Athabasca oil sands by applying PCA on air pollutants measured at a ground site. IVOCs have been indicated as an important class of SOA precursors. Identification of the major sources of IVOCs is needed in order to make effective measures to reduce their emissions. The objective of this study is interesting, but the data and presentation are too broad, lack of the focus on IVOCs given that the term of “IVOCs” is highlighted in the title.

Measurements of IVOCs were carried out using GC-ITMS. Atmospheric IVOCs are composed of both primary IVOCs, dominated by hydrocarbons, and oxygenated IVOCs, oxidation products of primary IVOCs and VOCs. The elution of oxygenated

C1

IVOCs from the GC column is likely incomplete. However, in this study, the split between hydrocarbon-IVOCs and oxygenated-IVOCs was neither performed nor discussed. In addition, the collection efficiency and recovery of IVOCs was not described, either. In the light of the description of chemical analysis of IVOCs provided in this study, it is unclear whether the measurements capture the variability of atmospheric IVOCs, which is critical for PCA.

This manuscript mentioned that PCA is unable to determine the fractional contributions of sources to IVOCs in the section of “5. Summary and conclusions”. Why is the PMF analysis not applied in this study? The number of samples is sufficient to provide a robust solution.

As mentioned above, ambient IVOCs includes oxygenated IVOCs, oxidation products of IVOCs and VOCs. However, the PCA in this study did not identify a component for oxygenated IVOCs.

Liggio et al. (2016) finds that the evaporation and atmospheric oxidation of low-volatility organic vapors from mined oil sands is directly responsible for the majority of observed SOA mass. Does this mean that the contribution of the component 2 to IVOCs shall be small given that this component is likely related to “Mine fleet and vehicle emissions”. More discussion is needed.

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C2