Point-by-point clarification to Referee #2

We thank the referee for his valuable comments/suggestions. We found the referee's comments very useful and in the right direction in order to improve the scientific quality of the paper. The point-by-point clarifications (in blue color) to the referee's comments and suggestions (in black color) are given below.

In this paper, Shailesh K. Kharol et al. presented an estimation of ground-level sulfur dioxide concentrations from the Ozone Monitoring Instrument (OMI) using SO_2 profiles from the Global Environmental Multi-scale – Modelling Air quality and Chemistry (GEM-MACH) model over North America for the period of 2005–2015. Also comparisons and trend analysis using OMI, GEM-MACH and in-situ SO_2 observations are presented.

General observations: The paper is quite interesting but need more details. The authors should highlight their work and the novelty of this paper. SO_2 from space and comparisons with ground or model observations is not a new subject, I suggest a more detailed presentation of Section 2 Data sets & methodology. The authors should show that this paper is more than just a database manipulation.

We have incorporated all the comments/suggestion in the revised manuscript as suggested by the referee. The point-by-point clarifications to the referee's comments are as follows:

1 Introduction
In this section the authors should connect their work with other studies, e.g. China, etc. Also, in this section, the authors should highlight the novelty of their work.

We agree with referee's view point and included the sentence "In contrast to total column SO_2, long-term records of ground-level SO_2 concentrations from satellite observations will be directly useful to assess air quality and associated health risks" in revised manuscript at Page number 2, Line number 18-20 to highlight the novel aspects of the paper.

The cited Fioletov et al., (2013) and Krotkov et al., (2016) papers are examples of related studies over China and other regions.

2 Data sets & methodology
In this section they should introduce more details.

We have included more details in data sets & methodology section in the revised manuscript.

The following paragraph on AMF related information is included in section 2.1 at Page number 3, Line number 9-16:-

"Even though the PCA algorithm directly estimates SO_2 vertical column density in one step using SO_2 Jacobians, the air mass factor (AMF) is effectively fixed at 0.36 (representing summertime conditions in the eastern USA), similar to the BRD algorithm. A better estimation of AMFs is needed for different regions to reduce these systematic errors that result from

conditions that do not match these. For this, we re-calculated the AMFs using SO_2 profile information from the high resolution (15 km x 15 km) GEM-MACH air quality forecast model (discussed in section 2.3), monthly-varying surface reflectivity from the MODIS satellite instruments, and an improved identification of snow. More details on Environment Canada Air Mass Factors calculation for SO_2 are discussed in McLinden et al., 2014; 2016b."

3 Results & Discussion

page 5/L1:5 you should give some coordinates and to specify if Flin Flon, Snow Lake, Sudbury, Thompson, Montreal are power plants (?)

We have modified the sentence as "There are far fewer sources in the western US and Canada, with a few notable exceptions such as Flin Flon (54.77^o N, 101.88^o W; copper smelter), Sudbury (46.52^o N, 80.95^o W; copper and nickel smelter), Thompson (55.74^o N, 97.85^o W; metal ore mining), Montreal (45.50^o N, 73.56^o W), the oil sands region in northern Alberta and power plants nearby Edmonton." in the revised manuscript at Page number 5, Line number 14-17.

page 5/L5:10 where is apparent the closure of Flin Flon copper smelter?

We have modified the sentence as "The closure of Flin Flon (54.77^o N, 101.88^o W) copper smelter in June 2010 is also apparent in OMI-derived ground-level SO_2 during 2011-2015 in Figure 1." in the revised manuscript at Page number 5, Line number 21-22.

Other observations: I suggest to introduce a study case using one (or more) power plants for the SO_2 sources mentioned in this work.

We have included following time series figure for Bowen power plant (34.13^o N, 84.92^o W), USA, and Flin Flon copper smelter (54.77^o N, 101.88^o W), Canada in the revised manuscript.

The following figure description is included at Page number 7, Line number 6-9 for the figure below in the revised manuscript.

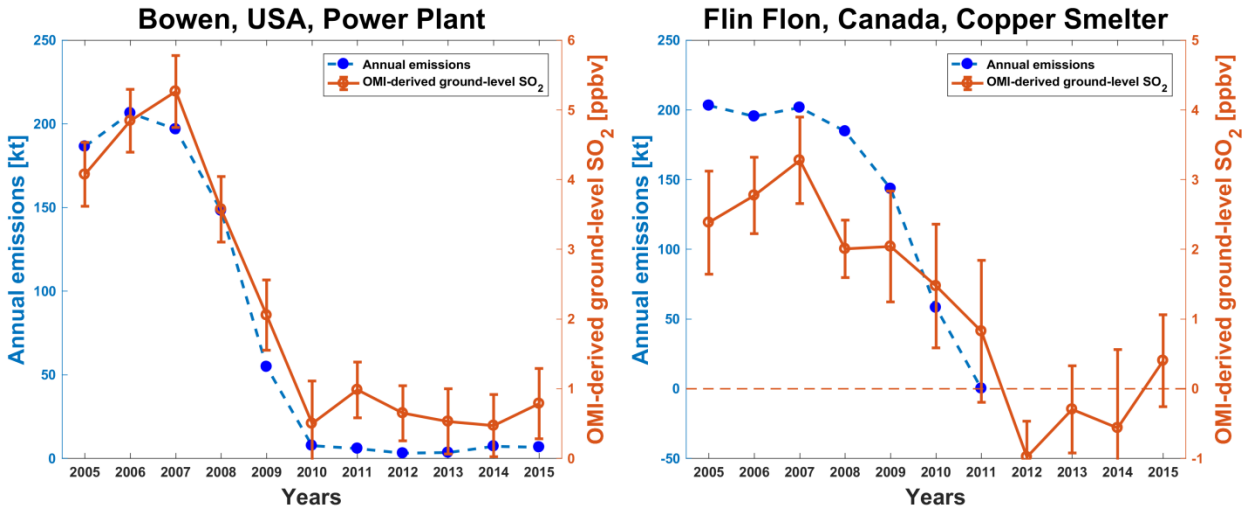

Figure 6 shows that bottom-up SO_2 emissions and OMI-derived ground-level SO_2 concentrations are temporally correlated even for larger individual point sources, namely the Bowen power plant (34.13^o N, 84.92^o W), USA, and Flin Flon copper smelter (54.77^o N, 101.88^o W), Canada. The bottom-up emission data for these sites are obtained from the US EPA (2016), and National Pollutant Release Inventory (NPRI, 2017), respectively.