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Emissions inventory of NO₂ and VOCs

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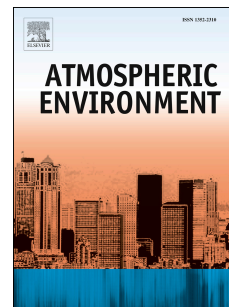
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Identifying the impact of Beirut Airport's activities on local air quality - Part I: Emissions inventory of NO₂ and VOCs

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1 Abstract

2 In Lebanon, the steady growth of aircraft movements at Beirut-Rafic Hariri International Airport
3 (RHIA) and its geographical characteristics, signifies the necessity to assess the impact of Beirut
4 airport on air quality. Up till now, no study has assessed the impact of Beirut-Rafic Hariri
5 International Airport (RHIA) on the air quality of Beirut. Hence, we produce the first emissions
6 inventory of Beirut airport activities (2012) - including emissions from aircraft landing and take-
7 off (LTO) operations, ground support equipment, stationary sources, as well as airside and
8 landside vehicles. This study, in which the first comprehensive emissions inventory in the
9 Middle East region is conducted, provides a methodology to assess airport emissions in a country
10 with no data. We estimated that in 2012, Beirut airport emitted 454.8 t of NO_x, 50.7 t of NO₂,
11 404.1 t of NO, and 24.4 t of VOCs. Results showed that aircraft emissions (Landing/Take-off
12 cycle and auxiliary power units) dominate the airport emissions for NO_x (91%), NO₂ (92%), NO
13 (91%), and VOCs (58%). Our emissions estimates will be used in identifying the contribution of
14 Beirut airport emissions to national emissions and in order to assess the airport's compliance
15 with environmental legislations and to assess mitigation options.

16 *Keywords:* Aviation Emission; Emissions Inventory Toolkit (EMIT); Nitrogen dioxide; Volatile
17 organic compound; Beirut

19 1. Introduction

20 Civil aviation is an integral part of the world economy providing 56.6 million jobs worldwide
21 and its economic impact is estimated at \$2.4 trillion, equivalent to 3.4% of world gross domestic
22 product (GDP) (ATAG, 2014). Commercial aviation activity is predicted to grow by 5% per year
23 over the next 10–15 years (CAEP 9, 2013). This would come at a cost, most notably a significant
24 increase in pollutant emissions. These emissions include nitrogen oxides (NO_x), Volatile Organic
25 Compounds (VOCs), carbon dioxide (CO₂), sulphur oxides (SO_x), particulate matter (PM) or
26 soot, etc. that have the potential to impact both the global climate and local air quality (LAQ)
27 near airports presenting risks to public health (nearby residents, airport workers and passengers)
28 (Jung *et al.*, 2011; Levy *et al.*, 2012; Schindler *et al.*, 2013; Yim *et al.*, 2013) and the
29 environment (FAA, 2015; Mahashabde *et al.*, 2011).

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