Ozone and Nitrogen Dioxide Pollution in a Coastal Urban Environment: The Role of Sea Breezes, and Implications of their Representation for Remote Sensing of Local Air Quality

Jeffrey Geddes¹, Bo Wang, and Dan Li

¹Department of Earth & Environment, Boston University

Corresponding author: Jeffrey Geddes (jgeddes@bu.edu)

SUPPLEMENTAL MATERIAL

This file contains Table S1, Figure S1, S2, S3, S4, and S5.
Table S1: Frequency of occurrence (in days) of the prevailing meteorological conditions identified each year June through August from 2010-2019.

|       | Sea Breeze | Westerly | Easterly |
|-------|------------|----------|----------|
| 2010  | 24         | 44       | 18       |
| 2011  | 31         | 32       | 19       |
| 2012  | 31         | 38       | 14       |
| 2013  | 31         | 40       | 14       |
| 2014  | 34         | 35       | 14       |
| 2015  | 29         | 31       | 21       |
| 2016  | 25         | 43       | 19       |
| 2017  | 24         | 41       | 16       |
| 2018  | 29         | 32       | 25       |
| 2019  | 25         | 38       | 21       |
| Average | 28.3   | 37.4  | 18.1    |
Figure S1: Annual summer midday average NO$_2$ (top) and annual summer mean daily maximum 8-hr average O$_3$ (bottom).
Figure S2: Mean diurnal evolution of surface temperature and wind speed throughout the day at Logan Airport for each predominant meteorological category (June-July-August, 2010-2019).
Figure S3: Vertical profiles of U- (horizontal) wind component (June-July-August 2010-2019) from Logan Airport processed AMDAR observations. At 14:00 LT on sea breeze days, we note the reversal of winds from easterly (negative values) to westerly (positive values) at an altitude of around 300 m.
Figure S4: Meteorological conditions at MIT Sailing Pavilion (top), Blue Hill (middle), and Hanscom (bottom) on days identified as westerly, easterly, or sea breeze days according to the Logan Airport observations (June-July-August 2010-2019).
Figure S5: Vertical profiles of potential temperature from the MERRA-2 meteorological reanalysis (dashed lines) and the Logan Airport processed AMDAR observations (solid lines), separated by prevailing meteorology identified on each day (June-July-August 2016).