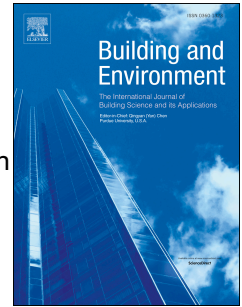


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The wind effect on sound propagation over urban areas: Predictions for generic urban sections

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1 The wind effect on sound propagation over urban areas: predictions for generic urban sections

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8 Abstract

9 The effect of a downward refracting atmosphere on distant sound propagation over various generic urban
10 areas is predicted. The work uses a two-step approach, by first computing the wind field with
11 computational fluid dynamics (RANS-CFD), and then adopting the mean wind field in a computational
12 acoustics (PSTD-CA) method. These approaches were found to be valid for the studied geometries. For an
13 urban configuration with multiple building blocks, a sound source is located in a street canyon,
14 representing road traffic, and receivers are located at a distance up to 500 m. From results of calculations
15 for various urban configurations, it can be concluded that: the sound levels increase due to the presence of
16 a downward refracting atmosphere, and this effect is larger for higher frequencies; the wind effect ranges
17 from 15 to 23 dB(A); the urban topology close to the source and receiver can largely influence the wind
18 effect; whereas vegetated roofs have the potential to reduce sound levels without wind, in a downward
19 refracting atmosphere the broadband effect is small (< 2 dB(A)), however, a potential for reducing noise
20 levels by roofs with low-frequency sound absorption has been identified.

21

22 keywords

23 Urban sound propagation; downward refraction; road traffic noise; vegetated roofs.

24

25 1 Introduction

26 In cities, the sound levels caused by noise from surface transport is often determined by nearby traffic. For
27 locations shielded from direct exposure to noise from surface transport, the influence of distant noise

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