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Modeling the sound field of open spaces using a diffusion equation model

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Steady-state and transient sound field modeling of open spaces, such as urban squares, courtyard-type traditional Chinese theaters, is discussed in this paper. It is well known that the application of the statistical room-acoustic theory is strongly limited in this case, because of the high non-uniformity of the absorption coefficient. In this study, a diffusion equation along with a recently proposed modified boundary condition [Y. Jing and N. Xiang, *J. Acoust. Soc. Am.*, 123, 2008, 145-153] is used to predict the acoustic characteristics of open spaces, in terms of both sound pressure level distributions and reverberation times. Three different types of open spaces are presented, including urban squares, quasi-cubic open rooms, and urban streets. This paper will compare the simulation results with the experimental results conducted in all these three cases (scale model), to verify the validity and efficiency of the diffusion equation model.