Preface

Special Issue on the Dynamics of Internal Pressures in Buildings

It has often been observed that internal pressures have played a significant role in the damage inflicted on buildings by extreme wind events such as tropical cyclones, in combination with high external pressures of the opposite sign. Whilst many codes and standards specify peak internal pressures based on simple quasi-steady aerodynamic models and a rigid building envelope, research since the 1970s has shown that with a large dominant opening in a building envelope, resonant effects do play a role through the occurrence of Helmholtz resonance. Fortunately this resonance is usually heavily damped through openings on other surfaces, background porosity ('leakiness'), large building volumes and building flexibility. However, quantifying these effects in real buildings, at high wind speeds, is difficult, and there are still questions to be answered regarding the accurate prediction of appropriate design values of peak internal pressures. Some of these questions have been addressed in the papers in this Special Issue.

The papers following cover various aspects of the dynamics of internal pressures, with some emphasis on the prediction of internal resonance effects:

- Overshoot and resonance produced by a sudden dominant opening (Guha *et al.*, Tecle *et al.)*,
- Effects of background porosity and 'leakiness' (Tecle *et al.*, Kim and Ginger, Guha *et al.*),
- Effects of quasi-static and dynamic building flexibility (Guha *et al.*, Sharma),
- Full-scale study on a real building (Guha *et al.*).

With the exception of the last paper, in which the authors studied a full-scale building, the studies used a combination of theoretical and numerical analysis, and wind-tunnel modelling. The relevant non-dimensional scaling parameters for fluctuating internal pressures are discussed in several of the papers, with the need to correctly scale the internal volume when carrying out wind-tunnel studies involving internal pressures highlighted by Tecle *et al.*

Experimental evidence in the paper by Kim and Ginger indicates the discharge coefficient departs considerably from the steady-state value, for the reversing flow through a building opening in high turbulence conditions. Further research is required to accurately quantify the discharge and loss coefficients for air flows in and out of openings in buildings, as the values assumed in analytical and numerical methods significantly affect the outcomes.

I would like to sincerely thank the authors of the six papers for their contributions, and also the reviewers of the papers for their valuable comments which have greatly helped to improve the quality of this Special Issue. The reviewers included: Associate Professor John Ginger, Professor Greg Kopp, Dr. Peter Irwin, Professor Ming Gu, Mr. Peter Kim, Professor Chris Letchford, Dr. Rajnish Sharma, Associate Professor Peter Richards, and Dr. Nick Cook.

J.D. Holmes
(Editor)