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Continuous and Discontinuous Modelling of Cohesive-Frictional Materials

SPIN Springer's internal project number, if known

Springer

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Preface

A knowledge of the mechanical behaviour of both naturally occurring materials such as soils and rocks, and artificial materials such as concrete and industrial granular matter is of fundamental importance to their proper engineering and scientific applications. The research activities in this broad area of applied mechanics have attracted scientists and engineers with a variety of backgrounds ranging from physics to civil engineering. For simulating the mechanical behaviour of the cohesive granular materials considered, two different frameworks of modelling and analysis have emerged. On the one hand, continuum-based models and, on the other hand, discrete particle methods, or in other wording "Continuous and Discontinuous Modelling" as referred to in the title of this volume are successfully applied to cohesive-frictional materials. In addition, the *micro-to-macro* or homogenization approaches, respectively, are used to relate microscopic discontinuum models to macroscopic continuum models.

The present volume contains contributions to the International Symposium on "Continuous and Discontinuous Modelling of Cohesive-Frictional Materials" organised at the University of Stuttgart by the research group "Modelling of Cohesive-Frictional Materials". This research group was established in May 1998 with full support of the German Science Foundation (DFG). Four different institutes of the University of Stuttgart participate in the research group, namely

- Institute of Applied Mechanics (Prof. W. Ehlers, Dr. S. Diebels),
- Institute of Geotechnical Engineering (Prof. P. A. Vermeer),
- Institute of Structural Mechanics (Prof. E. Ramm),
- Institute of Computer Applications 1 (Prof. H. J. Herrmann, Dr. S. Luding).

The research group focuses on the development of a multilevel approach for the modelling of cohesive-frictional materials. Within this framework, the main research areas can be found in the enhancement of the discontinuous (particle level) and continuum based modelling with an emphasis on the transition between these two approaches.

After two years of research, it was considered appropriate to organise the present International Symposium. For doing so, we obtained support from the German Science Foundation (DFG). We are grateful for the sponsoring provided by this organisation. The success of this Symposium largely rested on the efforts of a small Organizing Committee within our research group, namely:

- G. A. D'Addetta, Institute of Structural Mechanics,
- M. Lätzel, Institute of Computer Applications 1,
- T. Marcher, Institute of Geotechnical Engineering,
- Dr. T. Michelitsch, Institute of Applied Mechanics.

We would like to thank this Organizing Committee for the work in preparing and coordinating this meeting of researchers. No doubt, they have invested a lot of time and energy to guarantee a successful meeting for about 110 participants. Most of them came from Europe, but some had to travel much longer as they came from America, Australia or South Africa.

The highlight of the Symposium was a series of lectures of outstanding speakers. International experts in targeted research areas enlighted current developments and problems in the numerical modelling of cohesive-frictional materials and provided a deeper understanding of the microscopic and macroscopic description of geomaterials. We are grateful for their willingness to prepare and present their lectures. Their contributions are published in these proceedings volume. This book will proof not only helpful for specialist researchers in the fields of physics and engineering but also for students to gain experience in the fascinating field of cohesive-frictional materials.

In conclusion, we are convinced that this International Symposium on "Continuous and Discontinuous Modelling of Cohesive-Frictional Materials" has fulfilled its objective as a vehicle for the cross-fertilization of ideas between engineers and scientists engaged in research on continuous and discontinuous modelling of cohesive-frictional materials.

Stuttgart, November 2000 *The Editors*

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