Computational Methods in Multiphase Flow VI

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Multiphase Flow VI

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Preface

The study of multiphase flows is ever increasing in scope, primarily because of the increasing importance that these flows have in manufacturing, minerals extraction, environmental remediation, and medicine to name a few, and because of the technological advances that are constantly occurring. Despite experimental, theoretical and computational efforts that have spanned decades, we are still far from a full understanding of the complex behaviors inherent in multiphase flows. There are several causes for the difficulty in formulating accurate models even for the simplest of systems. The interaction of phenomena occurring at several different length scales, which in general cannot be decoupled from one another, is the primary difficulty. At the smallest (nano) scales, processes occur which are neither continuum nor molecular, and therefore cannot be treated either at the molecular level (the problem is too big) or at the continuum level (the model may miss important non-continuum effects). Examples of such situations are interface phenomena at engineered interfaces which involve both a vapor and a liquid phase, or surface-to-surface interactions via an intervening fluid. One length scale up (micro), structure formation can cause difficulties in formulating boundary conditions and constitutive equations. Most investigators have approached the problem by applying direct numerical simulation at some level, and using models or approximations to treat smaller-scale phenomena, with the ultimate aim of finding out enough about the flow behavior to be able to construct a constitutive model which captures the essential physics.

Presently, a “theory of everything” is not considered a viable option, because of the many possible combinations of flow parameters. Therefore, it is still necessary to categorize multiphase flow problems into various categories (e.g. bubbly flows, fluidized beds, suspensions). Within each of these categories, developing accurate descriptions of the flows is possible.

The overall focus of this series of conferences is the combination of experimental and computational techniques to gain a better understanding of individual classes of multiphase flow, The goal of the conference is that of facilitating the exchange of ideas and experiences directly and interactively, thereby promoting the development of knowledge in this increasingly important topic. The contents of this book reflect the quality of the submissions and the diligence of the reviewers, whom we wish to thank.

The Editors
Kos, Greece 2011

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