PREFACE

Preface

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This special volume contains 11 selected papers which were presented at International Conference on Recent Developments of Numerical Schemes for Flow Problems—30 years from upwind finite element methods, held at Fukuoka, Japan, from June 27 to 29, 2007.

Compared to the great success in structural mechanics, the application of the finite element method to fluid mechanics has been delayed. One of the main reasons is that equations in fluid dynamics include convection terms, which cause numerical oscillation in the conventional Galerkin approximation. In order to overcome this difficulty much effort has been done by many researchers during the last three decades. To the best of our knowledge the papers appeared in 1977,

- Heinrich, J. C., Huyakorn, P. S., Zienkiewicz, O. C. and Mitchell, A. R., An 'upwind' finite element scheme for two-dimensional convective transport equation, International Journal for Numerical Methods in Engineering, 11 (1977), 131–143,
- Tabata, M., A finite element approximation corresponding to the upwind finite differencing, Memoirs of Numerical Mathematics, 4 (1977), 47–63,

are earliest ones containing two key words, upwind and finite element. Although there are some papers before that year dealing with a kind of upwinding notion without mentioning it clearly, these two papers are still considered to be important from viewpoints that the former is an origin of the Petrov-Galerkin method developed later and that the latter treats

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the monotonicity in the finite element context. In this conference the progress in these thirty years of efficient and reliable numerical schemes for flow problems has been discussed. We hope that this volume will be a stepping-stone for further developments in this field.

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