

## Foreword of the CEMRACS'10 research projects publications

The CEMRACS (Centre d'étude Mathématique de Recherche Avancée en Calcul Scientifique) is an annual summer research session, for PhD students and young researchers, whose goal is to strengthen interdisciplinary collaborations between applied mathematicians and scientists of other fields, both from academia and industry. It is promoted by the SMAI (French Society of Applied and Industrial Mathematics) and was initiated by F. Coquel and Y. Maday, in 1996. In 2010, the fifteenth edition of the CEMRACS took place at the CIRM (Centre International de Rencontres Mathématiques, Marseille, France) from July 19th to August 27th, 2010. During the first week six speakers have delivered five lectures on various aspects of fusion plasmas researches: physical modeling, mathematical analysis, numerical approximations and analysis, scientific computing:

- Pierre Degond (CNRS, IMT Toulouse): Asymptotic preserving schemes for fusion modeling.
- Bruno Després (Univ. Paris VI) and Xavier Blanc (CEA-Bruyères le Châtel): Numerical methods for inertial confinement fusion.
- Virginie Grandgirard (CEA Cadarache): Numerical methods for magnetic confinement fusion.
- Stephen C. Jardin (PPPL): MHD simulations for fusion applications.
- Cédric Villani (ENS Lyon): Landau damping.

The following five weeks were dedicated to research projects sponsored by public and industry funds. During these weeks, after a daily morning seminar (the speakers included Claus-Dieter Munz: Univ. of Stuttgart, Germany; Christine Bernardi: CNRS and Univ. Paris 6, France; Guido Huysmans: CEA Cadarache, France; Barry Koren : CWI, The Netherlands, and many others), participants worked in teams composed of young researchers assisted by one or more senior researchers. About 120 researchers, from 20 different citizenships, attended this edition, including, computer scientists and mathematicians.

This volume gathers articles resulting from research projects initiated during the CEMRACS 2010 edition, dedicated to Numerical Modeling of Fusion aspects

in scientific computing and covers a wide range of topics related to kinetic and fluid modeling of fusion plasmas:

- Plasma modeling,
- Efficient numerical method for strongly magnetized plasmas,
- Statistical analysis.

We are very grateful to our colleagues who have proposed and supervised research projects, and we would like to express our gratitude to all the participants who contributed through their involvement to the success of CEMRACS '10.

**The organizing committee :**

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