

## COMPUTATIONAL ELECTRO-MAGNETO-HYDRO-DYNAMICS (EMHD)

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### ABSTRACT

Electro-Magneto-Hydro-Dynamics (EMHD) addresses all phenomena related to the interaction of electric and magnetic fields with electrically conducting or magnetic fluids. Electric and magnetic flow control, for example, is a challenging area of mathematical and engineering research with many applications such as the reduction of drag, flow stabilization to delay transition to turbulence, tailored stirring of liquids, pumping using travelling EM waves, and many others. The application of electric and magnetic fields in diverse branches of materials science such as crystal growth, induction melting, solidification, metal casting, welding, fabrication of nanofibres, fabrication of speciality composites and functionally graded materials, or ferrofluids is recently of growing interest. Fully coupled EMHD systems, that is, in situations where the flow-field is influenced by the electric and magnetic fields and where these fields are in turn influenced by the flow-field, are challenging research subjects with applications in geo- and astrophysics (dynamo, magneto-rotational-instability, etc.). Numerical simulations of many important processes (the growth of single crystals, metal casting for aerospace applications, aluminium electrolysis, etc.) require sophisticated tools for coupled fluid flow – heat/mass transfer – electromagnetic fields. In summary, computational EMHD is a vital subject of recent research with a long list of interdisciplinary applications and scientific problems.

Under the title of “Computational Electro-Magneto-Fluid-Dynamics (EMFD)” the topic successfully participated as mini-symposia at WCCM VI and WCCM VII. Recently, EMHD received major government funding, especially in Germany and China. In the European domain the recent COST-Action P17 might be mentioned as a clear indicator that EMHD activities are going to be intensified in several European countries. A dedicated mini-symposium on “Computational EMHD” ideally reflects recent research trends and developments of the field both at the European as well as the international level.