



Foreword

We obviously live in a non-stationary world, and what is true in life also applies to heat transfer. Although steady state solutions have been for a long time the main object of research, there is now a strong need for describing transient and non-stationary processes. This may be verified in the fields of conductive or radiative heat transfer, but this is particularly true in convection, where time is an essential feature of the flow structure and consequently of the heat transfer characteristics. In this domain indeed, new kinds of phenomena, such as critical situations, instabilities, chaotic structures, or transient behaviours governed by time-dependent boundary conditions, are now within reach of investigation. Since analytical solutions become an exception in the solution of such problems, this evolution has been made possible by the extraordinary parallel development of performing numerical algorithms and of more efficient computational resources, but also by the development of accurate local temperature and velocity measurements.

This is the reason why it appeared to be of primary interest to focus a meeting on convective heat transfer on the effects of time-dependent boundary conditions. As a consequence, a first ICHMT Symposium dedicated to this topic has been organized in 1996 in Çesme, Turkey.

Most participants proposed that a new “Transient Convection Heat and Mass Transfer” be held a few years later, with a larger scope. Actually, the 1996 meeting was mainly focused on single-phase convective heat transfer due to time-dependent boundary conditions. In this second edition, which took place in August 2003, also in Çesme, the call for papers was to two-phase flows, phase changes, flow in porous media, convective mass transfer and instabilities.

If we compare the contributions presented at the two “Transient Convection” symposia, a number of innovations and new topics are worth to notice:

- emergence of inverse methods in convective heat transfer;
- strong development of computational methods, and simultaneously of visualization and imaging techniques, allowing for a better comparison between modeling and experimental data;

- new interest in the influence of nonstationary conditions on the enhancement, or control, of convective heat transfer;
- new interest towards environmental problems, mostly connected to transient conditions;
- new considerations on stability and instability. This point is of fundamental and practical interest. Generally, stability conditions are analyzed in the case of stationary or quasi-stationary boundary conditions. But the question now is to extend the analysis to time-dependent boundary conditions, and also to clarify the notion of stability for a transient convective flow, and the kind of stability diagrams that we can build under such conditions. A number of communications and a special workshop were dedicated to this subject.

The following set of selected papers is intended to illustrate these new trends in research in the field of heat and mass transfer in convective flows.

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