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INFRARED THERMOGRAPHY FOR COMPLEX FLUID FLOWS

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Abstract

Infrared Thermography (IRT) is a methodology which allows for: remote detection of thermal energy that is radiated from objects in the infrared band, conversion of such energy into a video signal, and representation of the object surface temperature map. This represents a great potentiality that can be exploited for heat transfer evaluation in a lot of application fields and for many different purposes.

In particular within this contest, measurements performed with infrared (IR) thermography to evaluate wall convective heat fluxes in complex fluid flows are presented. If compared to standard transducers, the infrared camera appears very valuable because it: is non-intrusive, has a high sensitivity (down to $10mK$), has a low response time (down to $20\mu s$), is fully two-dimensional so, allowing for a better evaluation of errors due to radiation and tangential conduction within the sensor. By correctly choosing the measuring sensor, IR thermography can be exploited to resolve convective heat flux maps with both steady and transient techniques. A number of convective heat transfer measurements in complex fluid flows, performed with IR thermography by the author himself and by his co-workers, which range from very low speed flows (natural convection) to very high ones (hypersonic regime) are described.