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Study of Thermal Patterns on the Heated Wall by Infra-Red Technique

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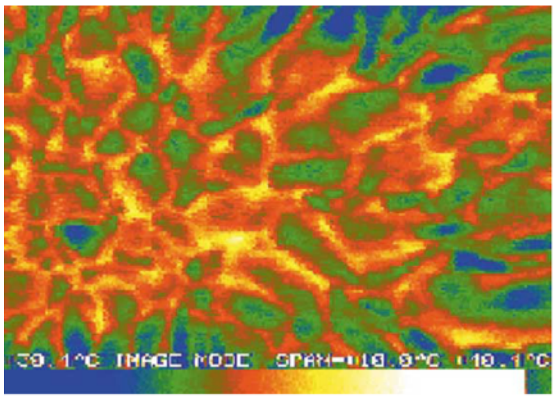

Fig. 1

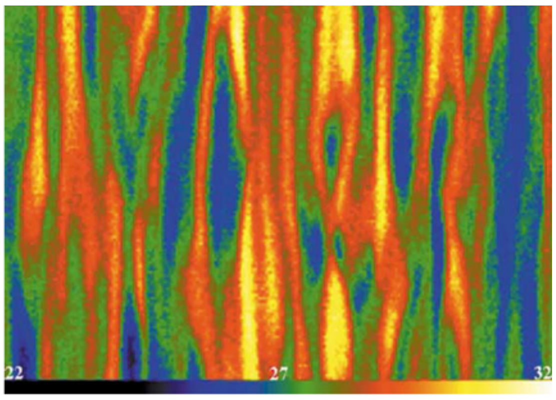

Fig. 2

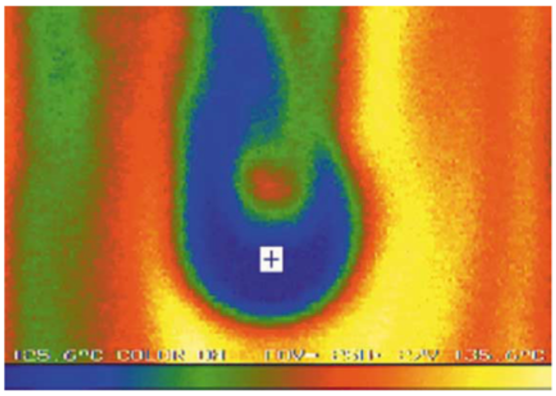

Fig. 3

We used a flume to study the near-wall turbulent structures. A heated test section at the bottom of the flume was made of a constant foil, 50 μm thick. The IR image created on the foil was recorded from below. The experiments were carried out at a constant heat flux from the heated foil.

The temperature distribution on the bottom of the flume can be considered as a trace of the flow structure near the wall, i.e. near-wall structures are the ones that cause the temperature variation on the wall, including the thermal streaks. The typical results of instantaneous temperature fields are shown in Figs. 1-3.

Fig.1 Natural convection in the flume. Rayleigh number $Ra = 3\times10^7$. Thermal pattern on the heated wall.

Fig. 2 Thermal streaks in forced convection. Reynolds number Re = 5100. The flow is from the bottom to the top.

Fig. 3 Thermal pattern around the single spherical particle attached to the heated bottom of the flume (the particle diameter is d = 4.75 mm, Ra = 5150). The flow direction is from the bottom to the top. The particle is located at "+".

References

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