

value at the mixing layer edges, and decrease towards a zero value in the uniform flow region. This corresponds well to the topology of figure 4 where quadrants *I* and *III* are associated with the cores of the structures in the dynamic mixing zone. In parallel, the magnitude of the contributions of quadrants *II* and *IV* becomes greater, reflecting a predominance, within heat flux, of the fluid ejections, which behave symmetrically in relation to the thermal mixing region axis (located at $y_{0.5T}$). This growing contribution of quadrants *II* and *IV* corresponds to the shape of the joint PDFs seen in figure 3, where the fluctuations T' associated to the opposite sign of u' are dominant in the self similarity region.

In the self-similarity region, the dominating movements appear to be ejections. The intensity of the interactions between the periphery of the structures and the outer zones of the uniform flow decreases gradually with x while the intensity of the ejections increases. The quadrant analysis can then clearly highlight the fact that the expansion of the dynamic and thermal mixing layers is associated with a growing domination of saddle point ejections and a weakening interaction between the structures and the outer regions of the mixing layer.

6 Conclusion

The correlations between velocity and temperature fluctuations were investigated across the mixing layer using the ability of the variable temperature hot wire anemometer to deliver simultaneous measurements of velocity and temperature at the same point. Showing a progressive drift from gaussianity as they move toward the edge of the mixing layer, the velocity temperature joint PDF patterns were analyzed by means of a quadrant analysis in which the heat flux was split into four components according to the positivity or negativity of $u'(t) \times T'(t)$. This study showed the ability of the variable temperature hot wire anemometry to deliver consistent velocity and temperature instantaneous values at the same point allowing the analysis of the contribution of the saddle point ejections in the mixing process.

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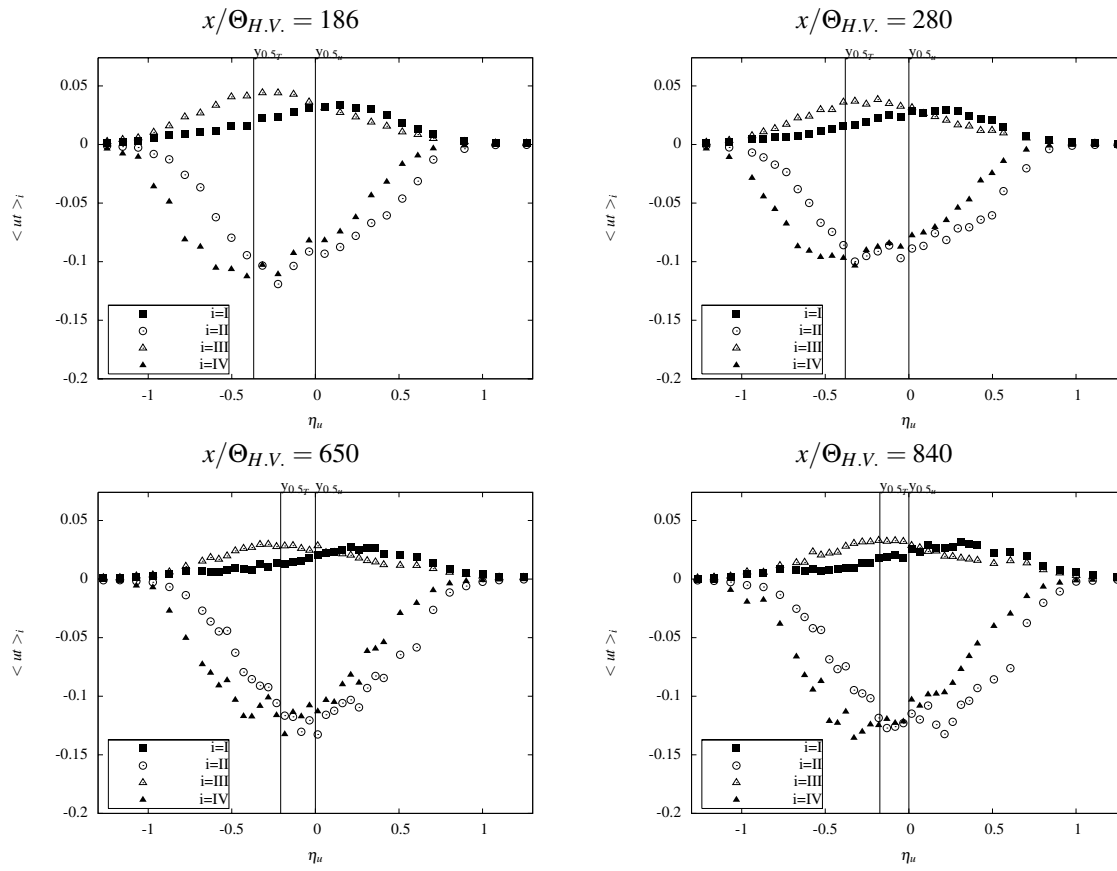


Figure 6. Quadrant heat flux contribution: transverse profiles of the averaged value of $u'(t) \times T'(t)$ splitted into four quadrants.