



POLYCHROMATIC HILBERT-DIAGNOSTICS OF VORTICAL STRUCTURES AND FREE-CONVECTIVE JETS

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Main subjects: heat and mass transfer, flow visualization

Fluid: free-convective jets in a liquid

Visualization method(s): polychromatic Hilbert-filtration

Other keywords: image processing

ABSTRACT: The method polychromatic Hilbert-filtration is used for visualization of fields of optical phase density in flows. Color flow visualization is carried out at use the quadrant Hilbert-filter and a source of white light. In the case of cross-shaped light sources Foucault-Hilbert's filtration with depending from wave length in weight factors for an optical signal and its two-dimensional Hilbert-image is accomplished. At the wave lengths depending on parameters of the filter Hilbert's two-dimensional transformation is performed. Hilbert's transformation redistributes energy of the optical signal from the low-frequency area to the high-frequency area of its spatial Fourier-spectrum. Hilbert-filtration in comparison with usual schlieren-visualization achieves the raised sensitivity due to the color contrast. Besides color gradients in the Hilbert-filtered signal carry an information about refractive index gradients in a structure of the optical phase density. Various applications of this method in investigation of vortical structures and jets are discussed.

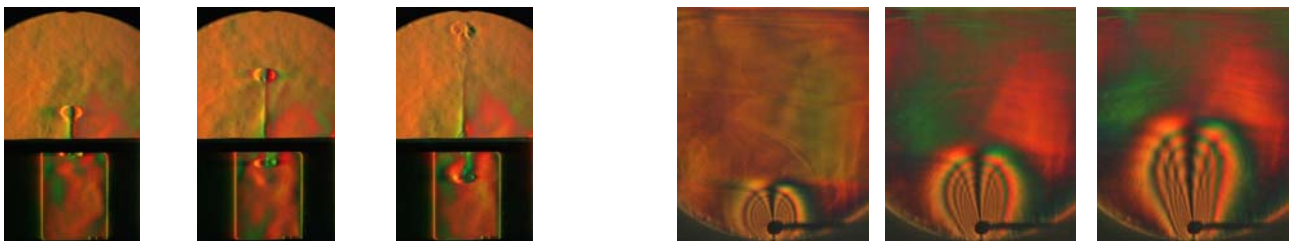


Fig. 1 Hilbert-visualization of the complementary vortical rings induced by pressure jump on an aperture (left), and the free-convective jets arising above suddenly included linear source of heat in strongly viscous liquid (right)

References

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