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Vorticity Curvature Criterion for the Identification of Two-Dimensional Vortex Structures JOSÉ HUGO ELSAS, LUCA MORICONI, Instituto de Física - Universidade Federal do Rio de Janeiro — Systematic procedures for the identification of vortices/coherent structures have been proposed as a way to address their kinematical and dynamical roles in structural formulations of turbulence. As a general rule, all of the known vortex detection algorithms are plagued with shortcomings. In this work, we focus on one of the most popular methods - the swirling strength criterion - and investigate how it performs in controlled Monte-Carlo tests. We, then, emphasize its main problematic issues: (i) vortex deformation and suppression due to near presence of intense vortical structures; (ii) vortex merging; (iii) spurious vortices created in many-vortex configurations and (iv) in the presence of background shear. The inner layer of turbulent boundary layer flows is, in particular, the region where the swirling strength criterion loses accuracy in a dramatic way. We propose an alternative vortex detection criterion, based on the curvature properties of the vorticity profile, which clearly improves over the results obtained with the swirling strength criterion in a number of relevant two-dimensional case studies.

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