Log #DFD20-2020-002648

Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Sorting Category: 37.8 (T)

Automated Identification of Vortex properties from individual vector fields using Bayesian approach. SAHIL KOMMALAPATI[1], OWEN WILLIAMS, University of Washington — While we have architypes for a number of turbulent coherent structures, such as a prograde vortex paired with a saddle point in 2D velocity fields of wall-bounded flows, it remains difficult to identify these structures using an automated procedure due to the complexity of the flow field and the number of parameters required. Here, we propose a Bayesian approach for the local identification of turbulent coherent structures by matching a model structure to turbulent velocity fields. As an initial validation of this approach, we employ a Markov Chain Monte Carlo solver to automate the extraction of the prograde vortex properties from individual PIV velocity fields, including estimation of convective velocity, which cannot be achieved with traditional vortex localization methods. Gaussian mixture models are then used to isolate portions of the resulting probability distributions corresponding to individual vortices in close proximity. These results enable the automated clustering of hairpin candidates into packets moving at the same convective velocity and investigations of the relationship between prograde and retrograde vortices. We intend to extend the use of this approach to more complicated flow structures such as vortex/saddle-point pairs.

[1]Membership Pending

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[X] Prefer Oral Session
[ ] Prefer Poster Session

Date submitted: 10 Aug 2020 Electronic form version 1.4