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Direct Computation of Two- and Three-dimensional FTLE/LCS from Particle Tracking Velocimetry Data SAMUEL RABEN, ROD LA FOY, SHANE ROSS, PAVLOS VLACHOS, Virginia Tech — Finite-Time Lyapunov Exponents (FTLEs) and Lagrangian Coherent Structures (LCSs) are becoming more commonly utilized for the interpretation of unsteady experimental flow fields. FTLEs provide information on regions of high attraction, repulsion, and shear in a flow field and can be used to investigate transport and mixing. Elevated values in FTLE fields, or ridges, can be evaluated in time and are what are referred to as LCS. In order to compute the FTLE field from velocity fields, typically artificial particles are seeded into the field and then numerically integrated to find positions in time from the given velocity information. This process can be very computationally expensive. When dealing with experimental data such as PIV or PTV it is possible to decrease the computational cost by simply tracking the flow tracers already present in the flow, avoiding the additional steps of inferring the velocity and artificial particle seeding. Through the use of Lagrangian particle tracking this work finds that it is more computationally efficient, as well as more accurate, to calculate FTLEs this way. This work considers both 2D as well as 3D flow fields for this analysis.

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