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Toward 3D vortex methods with deforming basis functions LOUIS ROSSI, CLAUDIO TORRES, University of Delaware — We present recent results extending methods for 2D vortex methods with deforming basis functions to three dimensions. Vortex methods are numerical schemes for approximating solutions to the Navier- Stokes equations using a linear combination of moving basis functions to approximate the vorticity field of a fluid. Typically, the basis function velocity is determined through a Biot-Savart integral applied at the basis function centroid. One outcome of rigorous analysis is an new naturally adaptive high order 2D method with elliptical Gaussian basis functions that deform as they move according to flow properties. This new class of methods is very unusual because the basis functions do not move with the physical flow velocity at the basis function centroid as is usually specified in vortex methods. The resulting analysis leads to deforming, ellipsoidal basis functions capable of achieving high spatial order. We now extend these results to three dimensions where traditional vortex methods suffer the additional shortcoming of not preserving the divergence of the vorticity field. We will discuss the latest results on our efforts to develop a complete 3D vortex method with adaptive, deforming blobs.

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