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Volume preserving curvature flows in Euclidean and Riemannian spaces

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Since the earlier studies of curvature flows of immersed hypersurfaces, the interest of the researchers has also been attracted by the volume preserving case, where the speed includes an additional nonlocal term which keeps the enclosed volume constant. For such flows it is usually possible to find a monotone quantity, e.g. the isoperimetric ratio, which is not available in the standard case. On the other hand, the nonlocal term induces the failure of some arguments based on the maximum principle, such as the avoidance property.

Volume preserving flows have been studied in the past to show convergence of suitable classes of initial data to a spherical profile in the Euclidean setting, resp. to a CMC profile in the Riemannian case. Here we report on two recent developments along these lines. We first describe the convergence to a spherical cap of capillary surfaces with prescribed boundary angle condition under a general power mean curvature flow (joint work with L. Weng). We then consider the mean curvature evolution of large Euclidean coordinate spheres in asymptotically flat 3-manifolds of General Relativity, which allows to construct a CMC-foliation by extending a method of Huisken-Yau (joint wok with J. Tenan).

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