**Dritschel, David G.**

**Contour surgery: A topological reconnection scheme for extended integrations using contour dynamics.** (English) Zbl 0642.76025

J. Comput. Phys. 77, No. 1, 240-266 (1988).

Summary: A numerical algorithm is described which, it is believed, can accurately model the dynamics of a two-dimensional, inviscid, incompressible fluid with unparallel spatial resolution. The fluid is assumed, however, to be divided into regions of uniform vorticity, conservation of vorticity ensuring that this remains true for all time. Like contour dynamics, the algorithm is concerned with following the evolution of the boundaries of vorticity discontinuity (contours). Unlike contour dynamics, the algorithm automatically removes vorticity features smaller than a predefined scale. For example, two contours enclosing the same uniform vorticity merge into one if they are close enough together. Also, the curvature along a contour is not allowed to exceed the inverse of the cutoff scale. At present, calculations with contour surgery resolve fluid motions extending over four to five orders of magnitude of scales (13 to 20 octaves). Such high-resolution pictures of two-dimensional vortex dynamics have been facilitated by and inded depend critically upon a nonlocal adaptive node adjustment scheme, and a variety of tests quantify the accuracy of the technique.

**MSC:**

76B47 Vortex flows for incompressible inviscid fluids
76A02 Foundations of fluid mechanics
76M99 Basic methods in fluid mechanics



**Keywords:**

numerical algorithm; two-dimensional, inviscid, incompressible fluid; unparallel spatial resolution; uniform vorticity; contour dynamics; contour surgery; two-dimensional vortex dynamics; nonlocal adaptive node adjustment scheme

**Full Text:** DOI

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