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We consider viscous flow in the exterior of an obstacle, in both 2D and 3D, satisfying the no-slip boundary condition at the surface of the obstacle. We seek conditions under which solutions of the Navier-Stokes system in the exterior domain converge to solutions of the Euler system in the full space when both viscosity and the size of the obstacle vanish. We prove that this convergence holds assuming two hypothesis: first, that the initial exterior domain velocities converge strongly (locally) in L^2 to the full-space initial velocity and second, that the diameter of the obstacle is smaller than a constant times viscosity. The convergence holds as long as the solution to the Euler system exists and remains sufficiently smooth. We then consider initial vorticities with compact support, vanishing near the obstacle, independent of both viscosity and size of the obstacle. The first author proved that, in 3D, such vorticity gives rise to a family of exterior flows satisfying the first hypothesis. For exterior 2D flow topology implies that the initial velocity is not determined by vorticity alone, but also by its harmonic part. We prove that the first hypothesis is satisfied in 2D if the harmonic part is such that the circulation of the initial flow vanishes around the obstacle. (Received August 07, 2007)