

1019-35-100

**Jalal Shatah** and **Chongchun Zeng\*** (zengch@math.gatech.edu). *Energy estimates of free boundary problems of the Euler equation.*

We consider the evolution of a droplet of inviscid fluid in the vacuum without gravity, including both cases when there is and there is not surface tension. The evolution of the fluid boundary and the velocity field is determined by the free boundary problem of the Euler's equation. Viewing this as a Hamiltonian PDE, we define a scale of functionals as "energies". These energies bound high Sobolev norms of the velocity field as well as the mean curvature of the fluid boundary. Thus we establish the regularity of the solutions for a short time depending on the initial data. Using these estimates, we prove that, as the surface tension goes to zero, the small surface tension problem converges to the zero surface tension problem considered by S. Wu and by D. Christodoulou and H. Lindblad. (Received August 08, 2006)