1015-35-114   **Jalal Shatah** and **Chongchun Zeng*** (`zengch@math.gatech.edu`). *Energy estimates of free boundary problems of the Euler equation.* Preliminary report.

We consider the evolution of a finite volume of invicid fluid in the n-dimensional vancuum without gravity, including both cases when there is and there is not surface tension. The evolution of the fluid boundary and velocity field is determined by a 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 mean curvature of the boundary of the fluid as well as velocity field. Thus we establish regularity of solutions for a short time depending on the initial data. Using these estimates we prove that as the surface tension goes to zero solutions of our problem converge to solutions of the zero surface tension problem considered by S. Wu, and by D. Christodoulou and H. Lindblad. (Received January 31, 2006)