998-65-101 **Hector D Ceniceros*** (hdc@math.ucsb.edu), Deparment of Mathematics, University of California Santa Barbara, Santa Barbara, CA 93106, and **Alexandre M Roma** (roma@ime.usp.br), Instituto de Matematica e Estatistica, Departamento de Matematica Aplicada, Universidade de Sao Paulo, 05311-970 Sao Paulo, SP, Brazil. *A hybrid adaptive method for multi-phase flows with an optimal geometry-based fluid indicator.*

A novel numerical methodology for computing multi-phase flows will be presented. The new method originates from the hybridization of the Level Set Method and Front-Tracking. The Level Set Method provides a continuous fluid indicator (the level set function) that can be readily used to update material quantities and Front-Tracking makes possible the accurate computation of interfacial forces. However, as it is well-known , the level set function is distorted by the flow and a re-initialization (re-distancing) procedure is needed at every time-step to keep it locally as a signed distance function. Using ideas from Computational Geometry, a novel approach will be proposed in which the signed distance function is computed optimally and up to machine precision in a vicinity of the interface. This new approach eliminates entirely the need to solve the level set advection equation and the ad hoc re-initialization procedure. Finally, the method will be put in a fully adaptive setting on which mesh adaption is performed both along the fluid interface with moving meshes (controlled Lagrangian tracking) and on the flow with adaptive mesh refinements. (Received February 16, 2004)