Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Formation of Gas Pockets in a Boundary Layer Under Turbulent Forcing[1] FRANCISCO PEREIRA[2], DAVID JEON, MORTEZA GHARIB, California Institute of Technology — Our experiments examine the formation of gas pockets in a flat plate boundary layer in water submitted to turbulent forcing. Air micro-bubbles are injected from wall orifices over surfaces with hydrophilic, hydrophobic and super-hydrophobic wetting properties. In this latter case, the surfaces are coated with paints with water repellent characteristics, or covered with vertically aligned carbon nanotubes (CNTs) that are chemically tuned to produce super-hydrophobicity. The turbulence level of the incoming flow is adjusted through meshes and grids. Bubble injection is operated at constant flow rate, and the mechanism of bubble growth and detachment is investigated through high speed recordings. Super-hydrophobicity is found to promote the attachment of discrete gas voids to the wall, with CNTs favoring the formation of a gas layer. Another finding is that the turbulence intensity affects the stability of microbubbles attached to the wall under super-hydrophobic conditions.

[1]This work is supported by ONR Grant N00014-11-1-0031
[2]FP was on unpaid leave from CNR-INSEAN (Rome, Italy)

Francisco Pereira
California Institute of Technology

Date submitted: 05 Aug 2013 Electronic form version 1.4