Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Simulation of High Re Boundary Layer Flows on Uniform Grids Using Immersed Boundaries with Vorticity Confinement[1] SUBHASHINI CHITTA, JOHN STEINHOFF, Wave CPC, Inc. — This paper describes the use of Vorticity Confinement (VC) to efficiently treat complex blunt bodies with thin shed vortex sheets and attached boundary layers. Because these flows involve turbulence in the vortical regions, there is currently no *ab initio* method to treat them on current or foreseeable computers. In fact, in spite of years of turbulence modeling efforts (such as LES or RANS), serious flaws in aerodynamic design involving vortex shedding may still be left undetected until the expensive prototype or production stage. Our basic premise is that, for a class of real-world problems requiring simulating ensembles of flow conditions for overall accuracy, conventional turbulence models suffer cost constraints. For these reasons, VC is used to rapidly simulate many operating conditions, as is often done in expensive testing programs for flying prototypes, and in realistic simulations. To achieve dramatically lower computational cost, VC treats the entire flow in a uniform, coarse grid with solid surfaces "immersed" in the grid so that they can be quickly generated for many configurations with no requirement for adaptive or conforming fine grids. Also, the VC method has the efficiency of panel methods, but the generality and ease of use of Euler equation methods.

[1]We would like to thank Dr. Frank Caradonna for his suggestions and support.

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Date submitted: 01 Aug 2015 Electronic form version 1.4