Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Wall-modeled LES of flow around a prolate spheroid at various angles of attack XINYI HUANG, XIANG YANG, Pennsylvania State University — We conduct wall-modeled large-eddy simulations (WMLES) of flow around a 6:1 prolate spheroid at various angles of attack (AOA) from 10° to 30°. An equilibrium wall model is used with a coarse mesh deploying 10 to 20 cells within one local boundary layer thickness. The Reynolds number based on the long axis length and the freestream velocity is 4.2×10^6. This flow was extensively examined experimentally by Simpson et al. in the 90s. We examine the pressure coefficients at a few streamwise locations in the azimuthal direction, as well as the locations of flow separation. Our WMLES results agree reasonably well with the previous measurements, and regions of secondary separation are also captured. WMLES provide more detailed flow information than Reynolds Averaged Navier Stokes. In our simulations, a pair of counter-rotating vortices is reproduced. These vortices originate from the leeward surface and extends in the streamwise direction, leading to notable downwash. The resulting wake is non-axisymmetric. Skewness of the wake is measured and compared to predictions of a lift line model.

Xinyi Huang
Pennsylvania State University

Date submitted: 24 Jun 2019 Electronic form version 1.4