Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Effect of free-stream turbulence on flow over a sphere. KWANG MIN SON, JIN CHOI, WOO-PYUNG JEON, HAECHEON CHOI, Seoul National University — In this study, the effect of free-stream turbulence on flow over a sphere is experimentally investigated by installing various types of grids upstream of the sphere. We measure the drag, surface pressure and velocity fields in the wake and boundary layer, and conduct surface visualization at $Re = 0.5 \times 10^5 \sim 2.8 \times 10^5$. The free-stream turbulence generates small separation bubble above the sphere surface and decreases the critical Reynolds number at which the drag coefficient rapidly decreases. With further increasing the Reynolds number, the laminar separation point is delayed downstream but the reattachment point closing the separation bubble is fixed at 115°. The main separation point is also fixed at 130°, resulting in constant drag coefficient after the critical Reynolds number. As the Reynolds number is further increased, the small separation bubble finally disappears but the main separation point is still fixed at 130°. Therefore the formation, regression and disappearance of the separation bubble are the key to the drag change due to the free-stream turbulence. More results of detailed measurement around the separation bubble and the boundary layer will be presented.

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Date submitted: 04 Aug 2006 Electronic form version 1.4