

DBD Plasma Actuator Design for Flow Separation Control by the LES with Compact Difference Scheme

***Kozo Fujii**

Institute of Space and Astronautical Science (ISAS)
Japan Aerospace Exploration Agency (JAXA)

*Corresponding author: fujii@flab.isas.jaxa.jp

DBD plasma actuators are considered to be very effective for flow separation control with little energy input. With the device, aerodynamic performance of the airfoil can be remarkably improved. There have been numbers of both experimental and computational effort, both of which proved that these devices changes separated flows to attached flows at least under relatively low Reynolds number conditions. With Japanese 10 PFLOS supercomputer “K”, more than 140 different cases of iLES simulations at the Reynolds number 6.3×10^4 are carried out. Compact difference scheme having 50-100 time higher spatial resolutions than conventional second-order schemes are used, which saves computer time and memory. Analysis of the obtained data not only shows the effect of many parameters of DBD plasma actuator device but also reveals flow control mechanism of DBD plasma actuators. Such analysis is possible only with both leading-edge supercomputers and numerical schemes having very high spatial resolutions.

Keywords: Flow separation, Plasma actuator, Large Eddy Simulation, Compact difference scheme