Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Adjoint-based optimal control of an airfoil in gusting flows
JEESOON CHOI, TIM COLONIUS, Caltech, CALIFORNIA INSTITUTE OF
TECHNOLOGY TEAM — In this study, we apply optimal control to an airfoil
in gusting flow to investigate the possibility of extracting energy. The gradients of
an objective function are obtained via the adjoint method and used to minimize
the cost. The immersed boundary projection method is used for our forward solver,
and the relevant adjoint equations are derived by the discrete-then-differentiate ap-
proach. Translational gusts are generated by a body force in the computational
domain upstream to the body, and the method finds the optimal angles of the airfoil
that exploits the greatest amount of energy. The influence of a vortex traversing an
airfoil is also investigated and optimized to reduce the fluctuating lift.

Jeesoon Choi
Caltech