Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Sweeping jets for flow control over propellers and wind turbine blades in a gust and shear environment from a fan array[1] FLAVIO NOCA, NICOLAS BOSSON, JAN DUBA, NATHAN PELLAUX, LUCA TERRADURA, BENJAMIN VIAL, MARK VUJICIC, University of Applied Sciences, Geneva, Switzerland (HES-SO), RAIMONDO PICTET, Swiss Federal Institute of Technology, Lausanne (EPFL), DAMIAN HIRSCH, MORTEZA GHARIB, California Institute of Technology — The performance of propellers and wind turbine blades instrumented with sweeping jets have been tested in spatially and temporally varying relative-wind conditions. Sweeping jets or fluidic oscillators allow Active Flow Control on an airfoil surface. A test bench was designed and built in order to channel air flow through a rotating hub and into three separate blades in a controlled manner. The blades were instrumented with a number of sweeping jets along their span. This research was enabled by the use of a windshaper, a new family of wind-generating facilities, which consists of an array of a large number of fans (wind-pixels) that may be arranged in various patterns and activated on demand. It is in some ways a digital wind facility that can be programmed to generate arbitrary winds of variable intensity and directions, such as uniform flows, gusts, and shear flows. In particular, sweeping jets were triggered independently on each blade depending on local flow conditions at the blade location. Force coefficients, torque coefficients, and efficiencies were evaluated in various flow conditions.

[1]Services Industriels de Genève (SIG)

Flavio Noca
University of Applied Sciences, Geneva, Switzerland (HES-SO)

Date submitted: 10 Aug 2020 Electronic form version 1.4