

Abstract Submitted  
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**Role of an active trailing-edge flap of a pitching airfoil undergoing dynamic stall**<sup>1</sup> GUOSHENG HE, EPFL, LARS SIEGEL, ARNE HENNING, DLR, KAREN MULLENERS, EPFL — The flow around a pitching NACA0015 airfoil with an active trailing-edge flap is investigated using two-dimensional time-resolved particle image velocimetry and surface pressure measurements. The Reynolds number based on the chord length is about  $5.5 \times 10^5$ . The airfoil is pitching around the static stall angle of attack of  $20^\circ$  and the flap is either oscillating around the symmetrical plane at  $\beta = 0^\circ$  or fixed at a constant deflection angle. The pitching of the airfoil and the deflection of the flap can be individually controlled in terms of mean angle, oscillating amplitude, frequency and initial phase angle. Below the stall angle, the lift of the static airfoil increases proportionally with the increase of flap deflection angle in the investigated range of  $-20^\circ \leq \beta \leq 20^\circ$ . Variations of the phase delay between the oscillations of the main airfoil and the flap lead to a rotation, expansion, or contraction of the dynamic stall lift curves. Higher-order harmonic flap oscillations for the pitching airfoil result in bending or twisting of the lift curves. Quantitative evidence has been extracted from the PIV data to help elucidate the modified aerodynamic characteristics of the pitching airfoil manipulated by the active flap.

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