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Effect of gust on flow patterns around a robotic hummingbird wing[1] ELOY N.M. GONZALEZ, New Mexico State University, B.J. BALAKUMAR, Los Alamos National Laboratory, FANGJUN SHU, New Mexico State University — Several studies have demonstrated the importance of the leading edge vortex in enhancing lift production during hovering flight for a hummingbird. Most of these studies were performed under steady inflow conditions. However, real-life ornithopters in the field have to routinely tackle directional changes in the wind and gust. In this work, we investigate flow field variations around a hummingbird wing under well-controlled gust conditions using a 2-degree of freedom robotic model in a water channel. Conditions of gust are simulated by mounting the model on a translation stage, which allows the control of gust profiles. Phase-locked and time-resolved particle image velocimetry (PIV) measurements were obtained around the wing in the presence of various gust levels. These measurements, in combination with force and moment measurements using a six-axis load cell, are used to understand transient flow phenomena induced by the gust, and their effect on the net thrust and lift forces over a range of Reynolds number (2100<Re<30000).

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