

Abstract Submitted
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Similarities and differences in the wake structure generated by different species of bats¹ TATJANA HUBEL, NICKOLAY HRISTOV, SHARON SWARTZ, KENNETH BREUER, Brown University — Flight kinematics and morphology differ greatly between the approx. 1200 bat species and the goal of our project is to understand how these differences affect the flight mechanisms, the generation of aerodynamic forces, and the resultant wake structures. Multiple individuals of three diverse species of bat were flown in the wind tunnel. The three species have different morphology, wing aspect ratio and wing loading, and exhibit different flight behaviors appropriate to their different ecologies. Particle Image Velocimetry in the cross-stream (Trefftz) plane acquired at 200 Hz was used to map the time-resolved wake velocities behind the bat, while three synchronized high-speed cameras monitored the wing motion. The measurements were taken at several flight speeds. Early predictions based on kinematic measurements suggest the development of discrete vortex rings as well as the generation of negative circulation in the wing tip area during the end of the downstroke. These hypotheses are tested and discussed, and the results show distinct differences between the species and as functions of flight speed.

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