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Wake structure and wing motion in bat flight[1] TATJANA HUBEL, KENNETH BREUER, SHARON SWARTZ, Brown University — We report on experiments concerning the wake structure and kinematics of bat flight, conducted in a low-speed wind tunnel using time-resolved PIV (200Hz) and 4 high-speed cameras to capture wake and wing motion simultaneously. 16 Lesser dog-faced fruit bats (*C. brachyotis*) were trained to fly in the wind tunnel at 3-6.5m/s. The PIV recordings perpendicular to the flow stream allowed observing the development of the tip vortex and circulation over the wing beat cycle. Each PIV acquisition sequence is correlated with the respective kinematic history. Circulation within wing beat cycles were often quite repeatable, however variations due to maneuvering of the bat are clearly visible. While no distinct vortex structure was observed at the upper reversal point (defined according the vertical motion of the wrist) a tip vortex was observed to develop in the first third of the downstroke, growing in strength, and persisting during much of the upstroke. Correlated to the presence of a strong tip vortex the circulation has almost constant strength over the middle half of the wing beat. At relatively low flight speeds (3.4 m/s), a closed vortex structure behind the bat is postulated.

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