

Abstract Submitted
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Various methods for extracting forces on a moving plate using Time-Resolved Particle Image Velocimetry (TR-PIV) D. RIVAL, D. SCHOENWEITZ, C. TROPEA, Technische Universitaet Darmstadt, Darmstadt, Germany — It is often very challenging or even impossible to measure the forces directly on swimming or flying animals. For this reason traditional control-volume methods are used to estimate the unsteady forces on the body in question. TR-PIV systems allow for the measurement of the full spatial and temporal velocity field in the control volume as well as along the bounding control surfaces. The corresponding pressure field can be integrated from the complete velocity-field data set. However, the measurement of the velocity field in the proximity of the bodys surface is at times cumbersome due to shadows and reflections. An alternate control-volume formulation¹ eliminates the need for velocity measurements in the proximity of the body. This method has been tested and compared to the traditional control-volume technique for a generic pitching and plunging flat plate in a hover chamber. The advantages and disadvantages of these methods are discussed in the context of their measurement accuracy.

¹J. Z. Wu, Z.-L. Pan and X.-Y. Lu, “Unsteady fluid-dynamic force solely in terms of control-surface integral, *Phys. of Fluids* **17**, 098102 (2005)

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