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Simultaneous pressure and velocity measurements using multi-dye microspheres implementing an intensity-ratio method DANIEL LACROIX, University of Washington, JULIAN MASSING, Technische Universitaet Berlin, CHRISTIAN CIERPKA, Bundeswehr University Munich, GUO-SHI LI, DANA DABIRI, GAMAL KHALIL, University of Washington, UNIVERSITY OF WASHINGTON TEAM, TECHNISCHE UNIVERSITAET BERLIN COLLABORATION, BUNDESWEHR UNIVERSITY MUNICH COLLABORATION — Luminescent pressure and temperature sensitive paints have been used to quantify pressure and temperature on surfaces, but not in flow fields. By incorporating pressure-sensitive, temperature-sensitive, and reference (non-sensitive) dyes into microspheres, which are then seeded into flow and imaged using high sensitivity EMCCDs, it will be possible to obtain pressure and temperature simultaneously. The pressure and temperature measurement methodologies are coupled with existing particle image velocimetry (PIV) methods to obtain simultaneous pressure, temperature, and velocity. Current research is focused on pressure and velocity measurements of these aerosolized microspheres using multiple cameras and calculating the ratio between the imaged pressure-sensitive and reference intensities. Detailed post-processing, which shows that the standard deviation of the ratios are reduced from approximately 10% to 5-6% will be discussed. In addition, we will discuss the implementation of the intensity-ratio method as well as the calibration process for determining pressure.

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