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Volumetric flow measurements of impinging jet on circular cylinder using STB[1] MIRAE KIM, EUNSEOP YEOM, Pusan National University, MATTEO NOVARA, DANIEL SCHANZ, REINHARD GEISLER, JANOS AGOCS, ANDREAS SCHROEDER, German Aerospace Center (DLR), KYUNG CHUN KIM, Pusan National University — Jet impingement is a direct and efficient way to transfer heat and mass in various applications. In practical applications, most jet flows are impinging on curved surfaces, however, less attention has been given to circular jet impingements on convexly curved surfaces. Interactions of three-dimensional flow structures of a round jet impinging obliquely on a convex circular cylinder was studied using high-resolution volumetric flow measurements by dense 4D Lagrangian particle tracking using the Shake-The-Box method and data assimilations by FlowFit. The Lagrangian tracks and assimilated 3D3C flow field confirmed that the 3D curved wall jet spreads widely in spanwise direction after impingement then merged to the jet centerline downstream. The Coanda effect on 3D wall jet flow along the cylinder wall is vividly shown with the delay of separation up to 180 degrees. The strong shear layer near the impingement area produces large-scale vortices with high vorticity. These structures distribute throughout the surface and break down to multiple vortex structures with lower vorticity. Small-scale negative vortex structures are moved away from the wall jet and are sustained longer at the edge of the wall jet.

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Mirae Kim
Pusan National University

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