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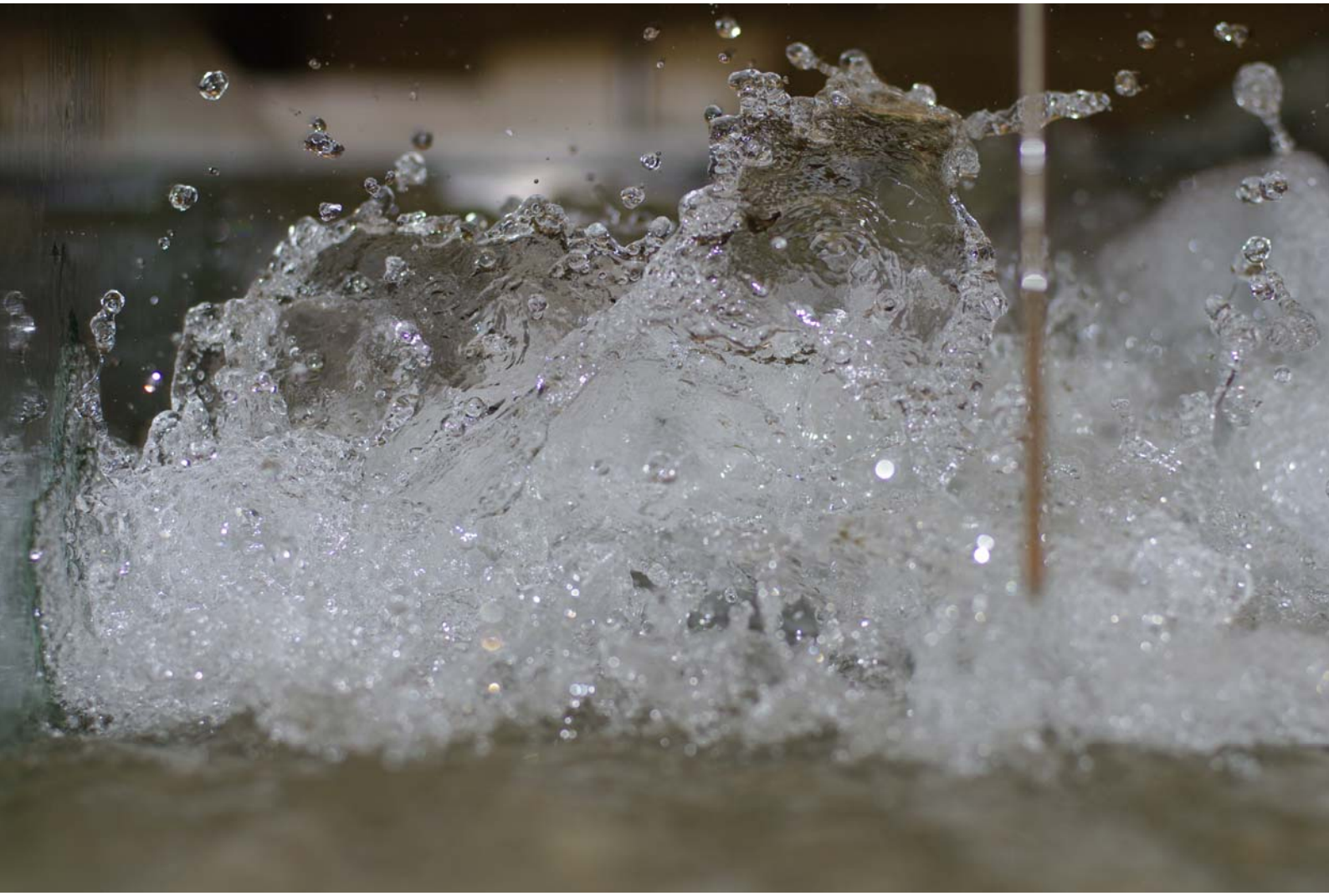
FACULTY OF ENGINEERING, ARCHITECTURE AND INFORMATION TECHNOLOGY

Air Bubble Entrainment and Water Projections in Hydraulic Jumps



Large air-water projections above the hydraulic jump looking downstream towards the jump toe and air-water projections immediately behind the impingement point. Flow direction from foreground to background. Note the air-water structures projected more than $5 \times d_1$ above the upstream water surface. $d_1 = 0.0395$ m, $Fr_1 = 5.1$, $Re = 1.2 \times 10^5$. Shutter: 1/180 s at f/2.5, ISO 100.

General view of the physical facility. Flow from right to left. $d_1 = 0.0412$ m, $Fr_1 = 3.46$, $Re = 0.9 \times 10^5$. Shutter: 1/50 s at f/4, ISO 400.

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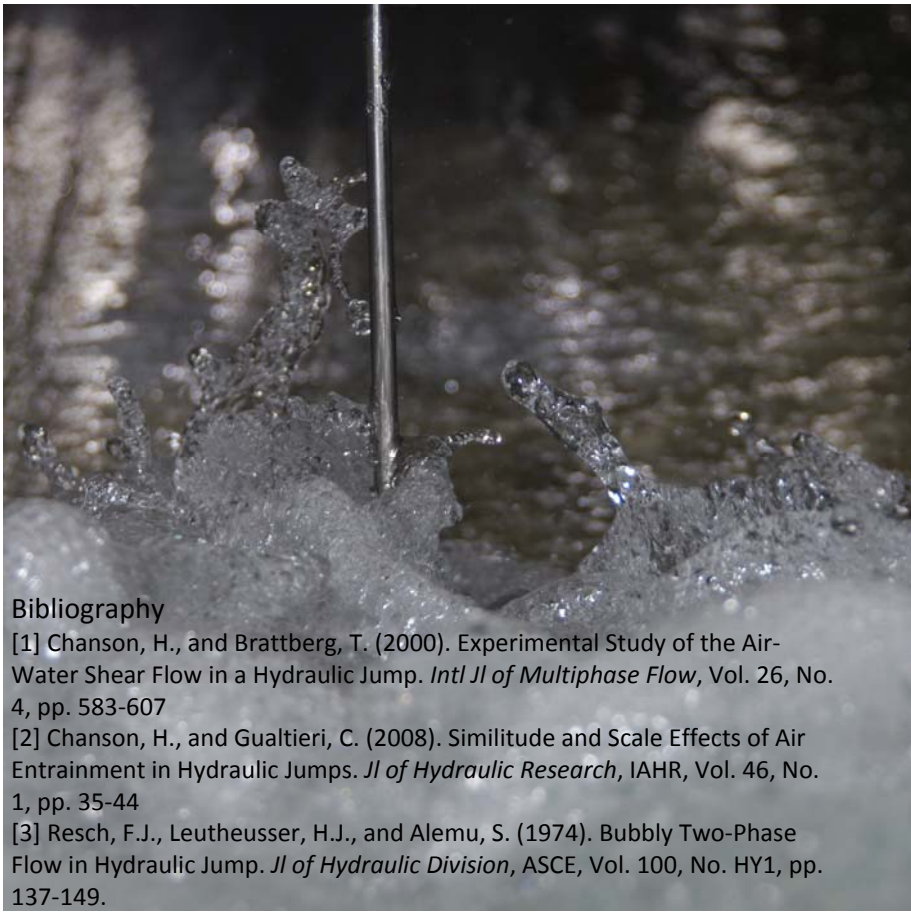
- **The hydraulic jump is a sudden transition** from a high-velocity open channel flow to a slower motion - the jump is characterised by the development of large-scale turbulence, a significant rate of energy dissipation, some spray and splashing, and air bubble entrainment
- **A hydraulic jump roller includes two distinct air-water regions**: the air-water shear region and the upper free-surface layer above - most air is entrapped at the jump toe/impingement point that is a source of vorticity and of air bubbles
- **High-shutter speed photographs and movies show large instantaneous air-water structures projected high above the roller surface** – the short-lived structures exhibit a wide range of shapes

Air-water projections above the roller looking upstream. Flow from background to foreground. d_1 = 0.0385 m, Fr_1 = 5.27, Re = 1.2×10^5. Shutter: 1/50 s at f/4, ISO 400.



Looking downstream at the impingement point and free-surface discontinuity. Flow from foreground to background. Note the air-water projections and water surface discontinuity at the impingement point (bottom). d_1 = 0.0395 m, Fr_1 = 5.1, Re = 1.2×10^5. Shutter: 1/180 s at f/2.5, ISO 100.

Bibliography

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