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Call for Papers

Special Collection on Recent Advances
in the Observation of Air-water Flows



Background

Air-water flows occur in natural environments and human-made hydraulic infrastructure whenever turbulence is strong enough to entrain air into the flow. Aeration leads to a change of flow properties and therefore must be considered in the design process of water infrastructure. Some effects of entrained air include flow bulking, drag reduction, enhancement of gas exchanges, and cavitation protection.

For more than 60 years, key contributions to advance the understanding and modelling of air-water flows have built upon physical modelling. Since common single-phase hydraulic engineering instrumentation fails to provide an acceptable level of insight, laboratory observations of air-water flows have been challenging and have relied on specialised multiphase flow instrumentation such as dual-tip phase-detection intrusive probes. Over the past few years, new analysis techniques and creative validation technologies for phase-detection probes have been developed, which enabled for the first time direct turbulence estimations and error quantifications. These advances have gone hand in hand with innovations in the application of non-intrusive and remote sensing measurement technologies in air-water flows, comprising ultrasonic sensors, high-speed cameras, and LIDARs. These instruments allow to remotely record time and spatial variations of air-water flow phenomena.

Aims and scope

This Special Collection aims to stimulate the scientific exchange and discussion on matters related to (1) the development of new algorithms of air-water flow analysis, (2) creative verification protocols and careful validation setups, (3) the development or use of new hardware or instruments to reach beyond the current frontiers of observation in air-water flows, and (4) new fundamental or numerical developments that are founded on these technological advances.

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This Special Collection aims to collate key contributions from air-water flow researchers in hydraulic engineering that:

- Provide new fundamental insights into air-water flow phenomena.
- Provide new interpretations of raw data from intrusive air-water flow measurements.
- Explore the use of innovative measurement approaches in air-water flows.
- Provide information on accuracy of air-water flow measurement techniques.
- Use innovative hardware setups or signal processing techniques to investigate air-water flow phenomena.
- Transfer new experimental developments for air-water flows into improved engineering design.
- Provide new air-water flow prototype-scale validation data for physical and numerical modelling.
- Critically explore the implications of new experimental developments for the advance in numerical modelling of air-water flow.