Abstract Submitted
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A Laboratory Study of Rain-Induced Underwater Turbulence Using Particle Image Velocimetry[1] R. LIU, X. LIU, J.H. DUNCAN, University of Maryland — The characteristics of rain-induced turbulence under a free surface are studied experimentally with Paticle Image Velocimetry (PIV) techniques in a 1.22-m-by-1.22-m water pool with a water depth of 0.3 m. A rain generator consisting of an open-surface water tank with an array of 22-gauge hypodermic needles attached to the tank bottom is mounted above the water pool. The tank is connected to a 2D translation stage to provide a small-radius horizontal circular motion to the needles, thus avoiding repeated drop impacts at the same location under each needle. The drop diameter is 2.6 mm and the height of the rain generator above the water surface of the pool is varied from 1 m to 2.5 m to provide different impact velocities. Both the flow field of a single drop impact and the turbulent layer under the free surface during rain simulations were measured with PIV. It was found that the drop penetration, the thickness of the turbulent layer under the free surface and the RMS velocity fluctuation are strongly correlated to the impact velocities of raindrops. The influence of this turbulence on the height of rebounding jet stalks from drop impacts is discussed.

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