Power-spectra of turbulent buoyant jets from laboratory measurements

Konstantinos Gkoutis, Ilias Papakonstantis, Panagiotis Papanicolaou, and Panayiotis Dimitriadis
National Technical University of Athens, Department of Water Resources and Environmental Engineering, Greece
(kostasgoutis@hotmail.com)

In total, 11 experiments of turbulent buoyant jets were carried out in an experimental apparatus, which includes a tank with dimensions 1.00 m x 0.80 m x 0.70 m. Specifically, in a stationary homogeneous ambient fluid, six (6) experiments were performed, with a temperature at the outlet significantly higher than the ambient water, and five (5) experiments with the same temperature but in an ambient saltwater environment of initial density difference between 18.4 and 19.2 kg/m3. The nozzle diameter was equal to 1.5 cm in all experiments, the densimetric Froude number was ranging between 1.72 and 3.73, and the Reynolds number ranging between 1222 and 3136. The experiments included flow visualization and concentration measurements based on the Laser Induced Fluorescence (LIF) technique using Rhodamine 6G as fluorescent tracer. A planar laser sheet was created and the experiments were recorded using a suitable video camera. The energy-spectra of the concentration were estimated using Fast Fourier Transformation and were compared to theoretical arguments, such as the K41 model.