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Title: Improvement of the Vertical Dispersion of Pollutants Resulting From Chimneys by Thermosiphon Effect

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Abstract: The dispersion of pollutants, resulting from industrial chimneys, in the surrounding atmosphere made the interest in realizing emitting conditions appears. It also encourages the vertical dispersion of these pollutants. At a given wind velocity, the height of this dispersion is essentially a function of the thermal power and the flow rate at the chimney exit. To improve these qualities, we propose a system that could be integrated to the industrial chimney exit. An open-ended vertical cylinder of larger diameter essentially constitutes this system. In order to determine the characteristics of the resulting flow, we simulated the problem in the laboratory while studying the evolution of a free thermal plume generated by a disk heated uniformly by the Joule effect at a constant temperature. The thermal plume expands in a quiet environment of isotherm temperature. To study the thermosiphon effect, we surrounded the plume source by a vertical cylinder opened at the extremities. Thermal radiation emitted by the hot disk heats the cylinder wall. The pressure drop due to the acceleration of the flow at the cylinder inlet causes the appearance of thermosiphon effect around the thermal plume. The analysis of the average fields of velocity and temperature shows that the thermosiphon effect entails a good homogenization of the flow at the system exit. Furthermore, the comparison of the results obtained at the exit of the two studied systems shows a relative increase of the flow rate and the thermal power absorbed by the air of the order of 50% under the thermosiphon effect. This result is expressed by a gain in the plume rise of the order of 40%.