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Thermal plume dispersion around a "cargo container" in crossflow WAYNE SMITH, GARY SETTLES, Penn State University — A passive scalar is released in a thermal plume emanating from a vent in a rectangular solid on a ground plane in crossflow. The scalar concentration accumulates in the recirculatory wake of this complex turbulent separated flowfield. The flowfield is simulated by a numerical solution of the RANS equations and by wind tunnel experiments. The practical application of this scenario lies in the detection of trace chemicals in vented plumes from sea cargo containers sitting in the sun. The transport is driven by the temperature difference between the air inside and outside the container. In this way contraband chemical traces are carried into the ambient air where standoff optical sensors may be employed to detect them. The measured and computed plume trajectories are compared and correlations are developed to describe the plume behavior based on the overall flow parameters. One result of this research is guidance on where to aim standoff optical detectors in order to detect chemical traces emanating from cargo containers.

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