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Understanding vapour plume structure in indoor environments for the detection of explosives TIM FOAT, Dstl & University of Southampton — Dogs remain the most effective method for the detection of explosives in many situations yet the spatially, temporally and chemically varying signature that they sense cannot easily be quantified. Vapour plumes can be highly unsteady and intermittent and the problem is further complicated in indoor spaces where turbulent, transitional and laminar regions may exist and where there may be no dominant flow direction. Intermittent plumes can have peak concentrations that are considerably higher than the time averaged values. As dogs can sample the air at 5 Hz it is possible that these unsteady fluctuations play a key part in their detection process. A low Reynolds number (Re less than 5000 at the inlet) benchmark test case for indoor airflow has been studied using large-eddy simulation computational fluid dynamics. Fixed concentration vapour sources have been included on the floor of the room and the resulting vapour dispersion has been modelled. Sources with different surface areas have been included and their instantaneous and mean concentration profiles compared. The results from this study will provide insight into canine detection of vapour in indoor environments.

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