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Tornado Formation by Rotating Plumes BRUCE SUTHERLAND, YONGXING MA, MORRIS FLYNN, University of Alberta, DARIA FRANK, PAUL LINDEN, University of Cambridge, DAPHNE LEMASQUERIER, MICHAEL LE BARS, IRPHE, University Aix/Marseille, CORENTIN PACARY, TIMOTHEE JAMIN, THIERRY DAUXOIS, SYLVAIN JOUBAUD, Ecole Normale Superieure de Lyon — Through laboratory experiments, numerical simulations and theory, we examine the evolution of plumes as they are influenced by background rotation in a uniform-density ambient fluid. In all cases the source Rossby number is sufficiently large that rotation does not directly affect the plume itself at early times. However, on a time scale on the order of half a rotation period, the plume deflects from the vertical axis. In some experiments and simulations, the deflection persists and the flow precesses about the vertical axis. In other cases, shortly after being deflected, the build up of swirling motion around the plume causes it to laminarize near the source to form a vortex that then extends vertically away from the source to form a columnar vortex, which we refer to as a tornado. For this phenomenon to occur, the plume at the source must be "lazy". The dynamics governing plume deflection and possible laminarization are revealed through analysis of three-dimensional simulations.

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